CONTRIBUTIONS TOWARD A MONOGRAPH OF THE LEPIDOPTEROUS FAMILY NOCTUIDÆ OF BOREAL NORTH AMERICA.

A REVISION OF THE MOTHS REFERRED TO THE GENUS LEUCANIA, WITH DESCRIPTIONS OF NEW SPECIES

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As it stands in our lists at present the genus *Leucania* includes all those species with hairy eyes and unarmed legs in which the vestiture is more or less hairy, the colors pale yellow or luteous tending to reddish, and the markings more or less strigate; normal noctuid maculation rarely complete. The antennæ of the male are simple or nearly so and the front of the head is without modification.

Setting aside a small series of narrow-winged, long-bodied forms as generically distinct under the name *Neleucania*, the remainder of the species agree in the somewhat robust body, moderate, not retracted head, long and functional tongue. The eyes are round, moderate in size, and the palpi reach the middle of front. These palpi are stout, hairy, the terminal joints short and obtuse. *Pilipalpis* is an exception, chiefly in the male. The thorax is usually quadrate, with collar and patagiæ fairly well marked; but in some series it is quite loosely clothed, with the parts indefined. The vestiture varies from thin hair, through flattened hair to a mixture of long scales and hair; the latter an unusual feature. Behind the collar centrally there may be a small ridge or crest, a small divided crest, or no obvious tufting at all.

The abdomen is untufted except at sides in the males. The vestiture on the under side is loose and woolly, the males being apt to have the legs sexually tufted.

The primaries vary somewhat in shape and may be quite stumpy or trigonate with marked or even acute apices.

The species occur throughout the United States and north as well as southward, though on the whole the genus may be said to be Northern rather than otherwise.

In the preparation of this paper my reliance has been first of all on the material in my own hands, which was more complete than that of any other single collection. From the United States National Museum I had 100 examples, including all save type specimens. From Dr. William Barnes, of Decatur, Illinois, I had his entire material in the genus, peculiarly rich in some local Western forms. From Mr. W. D. Kearfott, of Montclair, New Jersey, I had a series of specimens illustrating a few special forms. The collections of the American Museum of Natural History were carefully compared and some undetermined material was loaned. The collection of the Brooklyn Institute of Arts and Sciences (Neumoegen and Graef collections) was compared and specimens were loaned from it. From the collection of the American Entomological Society several specimens were secured. The Strecker material was carefully compared, and in addition, several correspondents sent me examples that will be specifically acknowledged later on.

Within the limits of the genus proper the species range themselves into a number of small or larger groups, some well, some ill defined, and in one or two cases not altogether easily separated on other than sexual characters. It might be put in a somewhat different way as a number of well-marked species, some of which remained true to type, others of which diverged and gave rise to forms which are not yet altogether well marked.

A somewhat well-defined series may be typified by *unipuncta*, in which there is a sharp ridge or crest behind the collar, not very prominent to be sure, but always recognizable in good examples. As additional characters we have the trigonate, pointed primaries in which both the ordinary spots are at least traceable, and the character of the male genitalia.

The group consists of only two, very unlike species, one of which is known in the female only.

Lutina differs from all our other species in that it has both the ordinary spots outlined by yellowish rings, the median lines complete, and the subterminal line obvious. In other words, the normal noctuid maculation is complete. The only example known to me is from Florida and is a female.

Unipuncta has the ordinary spots on the primaries paler, but not ringed, so that they are obvious, but not defined. The median lines are punctiform, and in some specimens both are completely traceable. Usually, however, the transverse anterior line is lost in the general powdery character of the wing, and sometimes the transverse posterior line shares the same fate. The general color is a variable shade of reddish or fawn gray or brown, sometimes with a little admixture of yellowish. The surface is speckled with black, forming a dark oblique subapical shade and a dusky shading along the median vein, at the end of which is a single white dot.

The secondary characters of the male consist of moderate fringes on all the femora inferiorly, and with outward fringes of long hair on the tibiæ, forming no tufts in either case; but those on the middle pair more prominent than any of the others. In the antennæ there is a longer bristle on each side of each joint.

The male genitalia are unique and rather simple. The harpes are somewhat narrow at base and, at a little less than half their length, divide into a broad inferior lobe and a narrow superior continuation, which again enlarges into a broad rounded tip, the inner surface of which is set with short, stiff, pointed spines. The clasper is a small, curved claw or beak at the point where the harpes divide.

In all the other species there is either no obvious tufting of any kind behind the collar or there is a small divided crest.

In the group *pseudargyria* we have two species with robust bodies and comparatively short, obtuse primaries, in which both the ordinary spots are marked and the transverse posterior line is composed of a double series of venular dots. Both are reddish luteous in color and are more or less black powdered.

Pseudargyria has the abdomen conspicuously tufted in the male, and the genitalia have dense hair and scale tuftings. The legs in the same sex are very prominently tufted, the most conspicuous clothing being on the anterior pair. The coxa has a tuft of long, curly scales on the outside. The femur has a bunch of thick blackish hair inferiorly, longest toward the tibia, capable of brush-like expansion. The tibia has a dense covering of black hair capable of fan-like expansion exteriorly—altogether a very striking modification. The middle leg is rather shorter and stouter than usual; femur with a fringing of long hair inferiorly; tibia set with long hair on all sides so as to form a prominent loose brush, not capable of fan-like expansion. In the posterior leg the femur is fringed with long hair inferiorly, but not so much as on the others; the tibia with a clothing of thin hair on all sides, not forming an obvious brush.

The genitalia resemble those of the group *commoides*. The harpes are very broad at base and narrow only a little inferiorly for nearly two-thirds their length, then they are cut off abruptly from below to form a narrow, oblong, obliquely rounded tip. This oblique tip is set with long, rather stout bristles. At the point on the upper margin where the oblong tip joins the broad body of the harpe there is a curved elevated ridge with the margins turned in, forming a crater-like cavity with the outline incomplete. The clasper is a moderately long and stout cylindrical hook, not much curved, arising from the inner portion of the crater over a broad, irregular, corneous plate.

The species occurs east of the Rocky Mountains throughout the greater portion of the United States and Canada.

Pilipalpis is obviously related to the preceding in appearance, but has a prominent diffusely margined black shading from the reniform to the transverse posterior line. I have only a female at hand, but Mr. Grote's type was a male. He compares it with *pseudargyria*, states that it does not have the exaggerated tufts on abdomen and tibiæ, and adds that it has "a curious fan-shaped tuft of spreading hair arising from the upper surface of the second joint of the unusually prominent palpi."

This character is distinctive and will serve to differentiate the male from all others of our species. The female is readily recognizable by the blackish shade already described. All the known specimens are from Florida.

Subpunctata stands by itself, but in many points resembles *unipuncta*. It is decidedly smaller, has somewhat narrower primaries, but of the same shape, and has the dark shading over the median vein, relieved by a single white dot at the end of the cell.

In other respects the type of maculation is the same, but the color in *subpunctata* is darker and it is closely *strigate* with blackish on the veins and in the interspaces. The secondaries are white at base, semitranslucent, with a smoky outer border. Behind the collar is a distinct divided thoracic crest, and this separates the species sharply from *unipuncta*.

In the male the anterior legs have a fringe of black scaly hair on the coxæ; the femora have a dense fringe of shorter scales; the tibial vestiture is short, dense, and not prominent. On the middle leg the femora have a moderate fringe of not very long hair; the tibiæ are set with moderate hair on all sides, but it is neither very dense nor brushlike. On the posterior leg the femora have a moderate fringe basally and the tibiæ have thin, scant, longer hair.

The male genitalia are characteristic. The harpes are very broad basally and beyond the middle narrow abruptly and evenly from both margins to about one-fourth their previous width; beyond that they broaden gradually to a slightly rounded tip which is furnished with a series of six long bristle-like hairs set in conspicuous pits. The clasper is an irregular corneous plate from which arises a short, cylindrical, nearly straight spur and two lower, somewhat curved, pointed processes; quite unique in the genus.

Dr. Strecker's species *complicata* is a small example of this species, whose home is in Texas and New Mexico.

Pallens is typical of a rather well-defined group in which the vestiture is thin and hairy, forming no obvious tufting on the thorax and leaving the collar and patagiæ not or but feebly defined. There are no lines or other marks on the collar and none on the thorax. The primaries are normally trigonate, with marked but not acute apices, without longitudinal dark lines or obvious discal spots, the median vein whitish, rarely well marked, and the transverse posterior line wanting or reduced to two black dots. The secondaries tend to blackish on the disk, leaving the margins white. In the male, the leg tuftings are not prominent, the femora fringed inferiorly and one or more pairs of tibiæ with longer hair, forming no tufts. The male antennæ have single, slightly longer lateral bristles on each joint.

The male genitalia are quite characteristic, and all the species resemble each other closely in this particular. The harpes are broad at base and broaden to the middle, where they are suddenly narrowed from below, the upper margin being continuous. Beyond this they broaden again into a rounded, lappet-like tip, the inner side of which is closely set with pointed spines of moderate length. The clasper consists of two processes from the same base; one is cylindrical curved upward, hook-like, with an obtuse tip; the other is bent outward and curved downward, rather beak-like in character, the tip usually obtuse.

While the group itself is thus well defined and rather sharply separated from the others, the species within the group are very closely allied.

In the first place, comparing all accessible examples of the true European *pallens*, I do not find any American examples that entirely agree with any of them. The American examples, which I term *luteopallens*, are uniformly less strigate, uniformly brighter, and, on the whole, with whiter secondaries. There is quite a marked difference in the genitalia, comparing five pairs of the American with three pairs of the European form. In the latter the harpes are quite prominently angulate on the superior margin and the upper angle of the tip is quite obviously marked. The spinulation of the inner side is also less abundant and shorter. The lower clasper is broader and more spatulate in form than any American specimen. The alliance is close, but as species go in this group *luteopallens* is not the same as *pallens*.

The femoral fringes of the male are very moderate and the hind tibiæ only have a little longer hair fringing above the middle. In this respect *pallens* agrees with *luteopallens*, which inhabits the Atlantic coast region.

Minorata is smaller and darker throughout, the secondaries in particular being blacker on the disk. The primaries have a broader, more stumpy appearance, due to the comparatively stouter body. In reality *minorata* is much more closely allied in appearance to *pallens* than is *luteopallens;* and this is also marked in the male genitalia, which are intermediate between those of *pallens* and *luteopallens*, while really distinct from both. The leg tuftings are much better developed, however, than in *luteopallens*, especially on the anterior and posterior tibiæ, which have an obvious fringing of long hair.

This species ranges along the Rocky Mountain region from New Mexico northward into British America and to the Pacific coast at Vancouver.

Oxygale is somewhat larger and broader winged than the previous species, and has a grayish shading over the luteous base. The streakings are very fine and not contrasting, giving the whole insect a very even appearance. The secondaries are entirely blackish except along the costa, or there is only a narrow whitish edging along the outer margin.

The male genitalia are exactly as in *luteopallens*, but the leg tuftings are even more marked than in *minorata*. In this species the middle tibiæ also are furnished with fringes outwardly, so that all are now fringed. The range of this species is from the middle Rockies southward, west to the Pacific coast, and throughout California.

Rubripallens differs from all the other species in this group by the reddish shading over the primaries. This is given by the reddish streakings over the yellow base, the paler veins being thereby more than usually relieved. The secondaries have a yellowish tinge and vary from this to a transparent smoky, the disk being always more or less blackish. The range of this species is from the middle Rockies into Utah.

The genitalia of the male do not differ from those of *luteopallens* and the leg tuftings are very like those of *oxygale*.

Pertracta Morrison belongs in this series, but I doubt its being an American insect. The type is in the Strecker collection, and, while the wings are perfect, the body is crushed as though it might have been papered. The locality given on the label is "Pennsylvania," and I have understood Dr. Strecker to say it came from a Philadelphia collector, whose name he did not give. I believe it to be an unusually well-marked *pallens*, with a reddish tint, a little discolored in the relaxing jar; in other words, a European specimen. Mr. Morrison was in several cases misled as to the source of his specimens, and I believe that in this case Dr. Strecker was also imposed upon. I can scarcely credit the occurrence near Philadelphia of a good species so like *pallens* and so rare that in twenty-six years not a specimen has been captured by any of the Philadelphia collectors.

In tabular form the species of this group may be separated as follows:

Light creamy yellow, streakings not contrasting; secondaries with a small discal area blackish .... *luteopallens*.
Darker, with a luteous tinge; streakings more obvious and somewhat contrasting; secondaries with more of disk blackish .... *minorata*.
Pale grayish luteous; streakings not contrasting; secondaries all blackish except the margins .... *oxygale*.
Reddish luteous, obviously streaky; secondaries with a yellowish tinge, smoky or blackish shaded .... *rubripallens*.

The group *albilinea* comprises another series of closely allied species which may be separated out with a little care and a fair material to work with. Superficially all the species agree in having the lower half of the collar white, or at least much paler than the upper portion, and, in good examples, white lines on the patagiæ. The wings are normally trigonate, of moderate length, the apices well marked, though scarcely acute. The median vein is white, and the white streak tends to continue in the interspace between veins 3 and 4. Below this white shade is a more or less diffuse red, smoky, or blackish shade which extends to the end of the median vein. Above vein 4 from its inception a red, smoky, or blackish triangular shade extends, starting as a point and broadening outwardly until, on the outer margin, it fills the space between vein 4 and just below the apex, where it again ends in a point.

These characters of maculation are quite obvious and are easily recognizable; but the male genitalic characters are equally strong and equally distinctive. The harpes are moderately broad at base, oblong to a point well beyond the middle, and there abruptly narrowed from below. The narrow extension from the upper margin is obtusely bent downward and then suddenly enlarged into a hatchet-shaped tip; the outer edge with a fringe of spinules directed inwardly. This is characteristic of the group, and occurs nowhere else in the genus. The clasper is usually divided into three processes, of which the lower is more or less spatulate or ligulate; the upper flattened or round, shorter and stouter; the median is a longer, more slender, usually pointed spur. The upper and lower processes are from the same base, the central structure arises separately.

As to leg structure, in the males the species as a whole agree in having long, thin, hairy fringes on the under side of all the femora. The anterior tibiæ are variably fringed outwardly and the tufting is obvious. The median tibiæ are not obviously tufted. The posterior tibiæ are variably furnished with long thin hair, tending to real tufts. Generally speaking, the northern forms are not so obviously tufted as are the southern species.

The male antennæ are barely ciliate and do not have longer lateral bristles on the joints.

Rubripennis differs from all others in this series and in the genus by having all the darker shadings bright, pinkish red. The male genitalia while after the group type have the claspers quite different from those of any other species. The lower process is long, cylindrical, and pointed; the upper a broad, short beak.

The home of this species is in Texas, but it extends northward into Missouri.

Albilinia has dark smoky or black secondaries in both sexes, which may be a little lighter at the extreme base only. It is on the whole a small species, the primaries dark luteous in ground and the smoky shades broad and diffuse. The discal dots may or may not be prominent.

The male genitalia are of the characteristic form, with all the processes well developed.

This form has a wide distribution, ranging in my material from southern Arizona to New Jersey.

Obscurior resembles the preceding in size and in the dark color of the primaries; but the maculation is more even and the discal spots are absent. The secondaries are whitish to the middle or beyond, the margin diffusely smoky.

The genital structure is like the preceding and the form may be only a local variety. But it comes from Manitoba, and I have found this faunal region so well marked that I risk the name, based chiefly on the more even color of the primaries and the partially white secondaries.

Diffusa is a markedly lighter colored and larger species, the secondaries white, with a diffuse smoky outer margin varying in width. The dark areas of the primaries are much smaller and much better defined, the terminal space tending to become leaden gray. There is no difficulty at all in separating out this form from both of the preceding.

The male genitalia are distinctive chiefly by having the superior process short, blunt, and cylindrical, like a thumb, while the lower process is quite flattened. There are other differences in detail which may be better understood by a reference to the figures herewith given.

This is the most widely distributed form, Walker's type, coming from Nova Scotia, while Mr. Druce figures a specimen as coming from near e City of Mexico.

The other species in this group agree in having the secondaries entirely white.

Limitata is from Texas and has the brown shading to the white median vein on both sides of it—that is, there is a narrow brown shading that begins near the base of the cell itself, margins the vein on each side, and, beyond it, continues into the brown subapical shade.

The male genitalia have the superior process flat and squarely terminated, the inferior more obviously spoon-shaped than in the other species.

Tetera differs from the preceding in that the median vein is not obviously whitish, and there is no dusky shade above the median vein. The dusky shadings are well marked, but a pinkish shading is introduced along the costa and in the submedian interspace. The discal spot is marked in all the specimens, and is also present in the preceding species.

In the male genitalia the species is the most aberrant of the group. The upper process of clasper is altogether lacking; the lower process is cylindrical, finger-like, and the middle hook is only moderate in length, a little curved and pointed at tip. The tip of the harpes is also quite different from the allied forms, and altogether this proves itself a good species without doubt. It is from Arizona.

Neptis resembles *diffusa*, but the secondaries are entirely white, the dark shadings on the primaries are much reduced, much more even, and the discal spot is absent in most cases.

The genitalia are practically like those of *diffusa*, but the lower process of clasper is a little more scoop-shaped at tip, and the tip of the harpe is somewhat more narrow and pointed. Otherwise in all respects the resemblance is very close. All the specimens are from Colorado.

Taken together the species recognized here make an unusually compact group, from which *rubripennis* stands out at once by its red color. *Albilinea* and *obscurior* are small, very dark species in which the secondaries are smoky or pale only at base. The latter may easily be a local variety of the former.

Diffusa is larger and paler, with the secondaries white except for the smoky dusky margin, which varies greatly, and *neptis* may be a local variety in which the smoky tinge disappears altogether.

Limitata is a good species with white secondaries, in which the median vein is margined on the upper edge.

Tetera is well marked by genital structure and by the tendency to pink tinging in the costal and submedian regions of the primary.

In tabular form the differences appear as follows:

1. Primaries with the darker shadings pinkish red .... *rubripennis*.
   Primaries with the darker shading smoky or blackish 2
2. Secondaries white at base, smoky toward and at outer margin 3
   Secondaries white 4
   Secondaries black .... *albilinea*.
3. Size small, colors dark, secondaries translucent at base, smoky margin broad. *obscurior*.
   Size larger, colors much lighter; secondaries white except for a smoky outer margin, which is narrow or very narrow .... *diffusa*.
4. Median vein white, with a brown margin on each side .... *limitata*.
   Median vein not obviously white, without dusky margin above 5
5. Discal dot obvious; a pinkish shading on costa and in submedian interspace .. *tetera*.
   Discal dot wanting or obscure; shadings reduced, even, not pinkish ...... *neptis*.

The group *ligata* is composed of three very closely allied species, which agree in rather small size, somewhat frail body, close, somewhat scaly vestiture, and a slightly convex thorax, in which the collar and patagiæ are not well marked. The collar has a single transverse line across the middle.

The primaries have the costa and inner margin convex, the outer margin oblique and somewhat rounded. A dusky median shade extends from base to outer margin over the median vein, which is partly white. This, with the small size and rather slight form, makes the characteristic feature in the species. The transverse posterior line is punctiform and, in general, is complete or at least completely traceable.

Ligata has a distinct pinkish shading, and the surface is obviously black powdered. The markings are rather well defined and the transverse posterior line is generally complete. The species is from the South and Southwest.

Flabilis is exactly like *ligata* except that the pinkish tinge is less obvious and the punctate transverse posterior line is not quite so well marked. It is from Long Island.

Rimosa is *ligata* with all the markings more obscure.

It is more than probable that all these are slight local varieties of one species which is not uncommon southwardly, but becomes very rare as we go north. Of *rimosa*, Dr. Thaxter was good enough to send me a male, which he compared with the type in his possession, and besides these two examples I know of none in collections. Years ago Mr. Tepper took two examples on Long Island, which formed the types of *flabilis*. One of these is now in the British Museum and one is at the agricultural college in Michigan. I have an example compared with the British Museum type, and, by the courtesy of Prof. R. W. Pettit, I was able to compare the other type as well. There are no other specimens known to me as *flabilis* in collections.

The male genitalia are exactly alike in all three forms. The harpes consist of a broad, oblong basal piece from which a narrow oblong process, rounded at tip, extends superiorly. The inferior angle of this broad basal piece is drawn out into a sharp point. At the rounded tip there are two long, spine-like hairs, but no other armature. At the extreme base of each harpe is a long, stout, somewhat curved, and irregularly toothed chitinous process. The clasper forms one slender, cylindrical superior finger and two stouter, more beak-like, parallel, pointed processes.

The leg tuftings in the male show no strongly marked characters, the femoral tuftings and fringings being scarcely more obvious than in the female. The antennal ciliations, however, are well marked. It is scarcely needful to attempt the separation of these forms by means of a table.

The group *insueta* is composed of species with short, stumpy wings, robust body, the thorax quadrate, with a divided crest behind the collar, the latter being well marked and with transverse darker lines. The patagiæ are also well defined and a little uplifted. The vestiture is coarse and the species have a roughly powdered appearance, due to a speckling of black. The ground color is a dull grayish luteous with a tendency to reddish which is dominant in *insueta*. The primaries have a streaky appearance, the veins being usually lighter than the margins and in the interspaces a dusky streak is usually obvious. The median vein is usually white or at least paler, but there is no well-defined dusky shade accompanying it inferiorly. There may be a dark or black basal streak, but this extends into the interspace and not along the vein. There is no black discal dot, though in some examples a few black scales help to define the white dot inwardly. The punctiform transverse posterior line is complete and sometimes tends to become geminate.

The legs in the males of this group have the sexual tuftings best developed in *heterodoxa*. The anterior femora are fringed beneath with long dense hair, about as long at base as at tip, and forming no tufts; the tibiæ are not modified. The middle femora are fringed for their entire length, but the hair at base is very much longer than that at tip; the tibiæ are outwardly clothed with very dense hair, thickest at the middle, but forming no expansible tufts. The posterior femora have a thin, moderate fringing at base only; the tibiæ have a small fringing of hair outwardly.

In *dia* the development is about the same; in *insueta* it is not quite so well marked, and in *megadia* it is so reduced that there is not much difference between the sexes.

The genital structure is similar in type in all the species; but no two are quite alike. The harpes at about the middle are suddenly constricted from below and continued along the superior margin into a more or less long-oval tip. There may be one, two, or half a dozen long bristle-like hairs at the edges of this tip. The clasper is made up of two parts; a flat long plate, the margins rolled over on the upper edge, and at tip the upper angle is drawn out into a sharp curved hook. From this plate arises a long, cylindrical finger-like process directed obliquely upward and outward and extending well beyond the upper margin of the harpes.

Only in *dia* are the lateral bristles of the male antennæ in the least marked.

Dia is the smallest of the species, the veins all white marked and no obvious black markings anywhere in the wing. The species is from California.

Megadia is somewhat larger, much better marked, the dark shadings obvious; a black or blackish curved basal streak extending into the submedian interspace. It extends along the mountain ranges from Arizona into British America.

Heterodoxa is again larger, markings fully as obvious as in the preceding; but there is no curved basal dash and the punctiform transverse posterior line is more obvious. The male genitalia also show an obvious difference as compared with those of the preceding two forms and resemble more nearly the following. It extends throughout the northern United States to the Pacific coast.

Insueta is perhaps a little larger on an average than *heterodoxa*, and decidedly reddish in color, varying somewhat, however, on this point.

The streakings are more prominent than usual and, altogether, it has all the group characters better and more completely developed than any other species. The black basal streak is obvious in this species.

In tabular form the species separate readily, as follows:

- Primaries without a basal black streak.
  - Size small, all the markings obscure; veins white, not obviously relieved by darker streakings; secondaries whitish, even .... *dia*
  - Size larger, all the markings obvious; veins relieved by definite streakings; secondaries outwardly blackish or smoky, not even .... *heterodoxa*
- Primaries with an obvious curved black or blackish basal streak.
  - Size small, primaries more obtuse; color luteous dull gray, rarely shaded with red .... *megadia*
  - Size large, primaries a little more pointed; color reddish gray, shading into brick red.. *insueta*

The species *extincta* is entitled to rank as a group by itself because of its rather narrow primaries which are acute at the apex, a little incurved below, and form an obvious obtuse angle below the middle of the wing. The thoracic vestiture is rather fine and thin, forming no obvious tufts and relieving neither collar nor patagiæ; the collar is crossed by two transverse lines. The primaries are very obviously streaky, while the lines are not contrasting; there is a white point relieved by a few black scales at the end of the median vein and the transverse posterior line is bent very strongly inward below the middle.

In some respects the species resembles the *ligata* group, but the wing form differs materially and the sexual characters are more nearly like *phragmatidicola* through *juncicola*.

The leg tuftings in the male are not well developed. There is the usual fringing on the femora, much reduced and a little thickening of the vestiture on the middle tibia; nothing like a well-developed tuft.

The genitalia of the male consist of very broad, irregularly oval harpes from the upper margin of which very narrow tips extend. The end of each tip is somewhat rounded and set with long, slender, bristle-like hair. The clasper consists of a broad chitinous plate from the upper angle of which come two curved corneous processes. One of these is cylindrical, hook-like, and extends downward; the other is beak-like and is directed upward, extending beyond the upper margin.

The male antennæ have single longer bristles laterally on each joint.

The species is not easily mistaken and occurs along the Atlantic coast to Maine.

Leucania juncicola also stands by itself on genital characters, but superficially it resembles the group *phragmatidicola* very closely. The body is robust, thorax quadrate, collar and patagiæ well marked. The collar has a series of transverse lines of different colors, culminating in a broad purplish band below a narrow whitish tip; the band made up of three narrow lines of black, blue, and brown. The little tuft behind the collar is also purplish. Transverse posterior line punctiform usually reduced to two dots only; a black dot in the submedian interspace. Secondaries more or less smoky.

L. multilinea of the next group resembles *juncicola* quite nearly, but has white secondaries and a less prominently lined collar. It also lacks the black dot in the submedian interspace, hence the differentiation is easily made when the two are at hand together. In the male the prominent tuftings of *multilinea* are at once distinctive. All the specimens of *juncicola* seen are from Texas or Florida.

The leg tuftings of the male are not especially marked. The femoral fringes are much as described for the group *insueta*, but are not so long or so well developed. The tibial tuftings are obvious, but not prominent; also like *insueta* in general type.

The male genitalia are unique. The harpes are very broad, almost triangular in shape, the angles broadly rounded, the upper outer margin prolonged into a narrow, parallel process, rounded at tip. At the point of junction with the basal portion is an elevated slightly rounded ridge, toothed at the edges. The narrow process is closely set at tip and along its inferior margin with long bristle-like hair arising from definite pits. The claspers arise from he upper outer angle of a broad chitinous plate; one of them is beak-like and curves down, almost parallel with the edge of the plate; the other is a slender cylindrical process a little enlarged above the middle.

The male antennæ are practically simple.

The group *phragmatidicola* consists of yellow or reddish luteous species with moderately elongate trigonate primaries in which the apices are at least well marked if not pointed. The body is quite robust, collar and patagiæ well marked, and in good specimen an obvious little divided crest anteriorly. The collar has one, two, or even three transverse lines, but these do not culminate in a purplish band. In the type form the median vein is white, margined with a black or dusky shading; there is a triangular dusky shade based on vein four, extending nearly to the apex, and this is traceable in all save the palest forms.

The leg tuftings in the male are so variably developed that it is deemed best to refer to them under specific headings.

The primary sexual characters of the male are distinctive; very similar for the species as a whole, yet with plenty of difference in detail, easily determinable by a comparison of the figures herewith given.

The harpes are broad at base, narrowing a little on the inferior margin until, at about two-thirds from base, they are abruptly cut so as to form a trigonate lappet, continuous on the upper margin. On the lower margin and at tip are a series of long, stiff hairs set into pits. At the junction of this outer narrow process is a disk-like, semicircular plate with incurved edges, which seems perforated with a varying number of openings, no two species being quite alike. Then there is a broad chitinous plate from the upper outer angle of which come two processes. One is long, curved, beak-like, pointed at tip, and extends downward; the other is short, cylindrical, and extends upward over the base of the first. Sometimes a third process comes from the lower outer angle of the plate and sometimes the inner inferior angle is obtusely extended. In some species a flattened process extends over the chitinous plate from the thickened upper margin, and this may or may not be perforated.

The species of this series are not difficult to separate if both sexes are at hand. A male can be placed without difficulty at all times, and a good female may be generally determined by the tables so nearly as to make identification easy from the descriptions.

Two main, though unequal, divisions may be based on maculation, though they are not entirely natural. In the majority of the species the median vein on the primaries is white, in whole or in part, and along this vein, above or below, or on both sides, is a black or smoky line or shade extending to at least the end of the cell. While this character is very unequally developed, it is at least obvious in every reasonably good example, and separates the species possessing it from the smaller series, in which, while the vein may be white, or at least pale, there is no defining shade or line. Such species as lack the defining shade have no obvious maculation of any kind and are almost uniform, except for the slight differences between the interspaceal streakings and the veins.

In the first series *multilinea* stands alone, because in the male the anterior tibiæ are most heavily tufted with dense masses of discolored hair and scales capable of expansion. The antennæ also, in this sex, have longer lateral ciliæ than in any other species. It is a medium-sized or small form, the primaries light yellow, prominently streaked in the interspaces, and the collar white, distinctly banded. The secondaries are white, scarcely soiled even in the female. The transverse posterior line is usually reduced to two small black dots, and this, in combination with the white secondaries, prominent streakings, and small size, will differentiate the species even in the female.

In all the other species of this group, as well in the second as in the first division, the middle leg is the one most obviously tufted in the male. But this character varies greatly, and in a few instances there is only a marked thickening of the vestiture, rather than a brush or tuft.

Commoides and *phragmatidicola* have the sexual tuftings most prominent, and, in addition to the dense mass of vestiture on the middle tibia, that member is somewhat shortened and the outer spur is flattened and curved, the tip acute.

Commoides is a very stout, reddish-streaked form, with smoky-brown secondaries, and this differentiates the species at once from all others in the series. The streak margining the pale median vein is black, there are black streaks along the inner margin and outwardly, and the streakings between the veins tend to become black. The sexual tuftings tend to become discolored, and the harpes of the genitalia are densely clothed on the outside with long yellow hair intermixed with broadly flattened scales. This prominent mass of vestiture can be somewhat expanded, but seems to form no real tufts or brushes of hair. There is at least one pair of longer pencils between the claspers at the base of the uncus, and these are probably capable of fan-like expansion. The species occurs throughout the eastern United States and Canada to New Mexico.

Phragmatidicola is altogether different in appearance and varies much more. It has a wide distribution and the variations are somewhat local. The primaries are narrower, more trigonate, and the apices more pointed than before. The ground color is pale luteous and the streakings are reddish between the light or dark veins. The dusky shading over the median vein may be smoky or blackish, and as a rule both sides of the vein are margined. The series of punctiform spots marking the transverse posterior line is usually complete though never very prominent, and there is usually a lighter shade through the cell and obliquely to the apex.

The sexual tuftings are very much as in *commoides* but less discolored and somewhat less prominent. The secondaries are white, tending to become a little smoky on the veins and outwardly. The species occurs from the Atlantic to the Pacific and from Canada to Florida.

In all the other species of this series the outer spur on the middle tibia of the male is cylindrical. straight, pointed at the tip and either short or very short.

Imperfecta stands by itself because of its dark smoky gray color, which is neither powdery nor obviously strigate. It has somewhat the appearance of an undersized, dark *unipuncta* with the powderings out, and this is emphasized by the fact that the black or blackish longitudinal shading covers the median vein almost to the end of the cell; leaving only a short, white, angular spur to emphasize the usual black point. The secondaries are whitish, with a tendency to smoky margins. The sexual tuftings are not prominent and the antennal ciliations are small, not longer toward the tip.

The species has been thus far received from Arizona only.

Anteroclara resembles *phragmatidicola* in appearance very closely. With males for comparison there can be no difficulty, of course; but there is a real difference in superficial characters, though it is difficult to locate in one word. As a whole, the species is a little larger, a little broader winged, with somewhat less pointed primaries. It is more yellow in color, less streaky in appearance, the black dot at the end of the median vein often wanting, never prominent, transverse posterior line reduced to two small interspaceal dots, and the upper margin of the pale median vein not in any way relieved. The secondaries, especially in the female, have a smoky appearance, and altogether this seems a duller, more even species than its ally. Besides the difference in the tibial spurs, the sexual leg tuftings of the male are much reduced in *anteroclara* and the anal tuftings are not at all prominent. The specimens are from Calgary, Vancouver, and the Northwestern United States.

Calgariana is like *phragmatidicola* in size and appearance, except that the color is very decidedly reddish. The white median vein stands out in strong contrast, and in most of the specimens the black margining shade is very distinct. From *phragmatidicola* the sexual characters separate this species; from *anteroclara* the narrower, more pointed primaries and the color serve as distinctive characters. The secondaries are white in both sexes, the female only with a little fuliginous shading and somewhat smoky veins.

Thus far the species has been received from Calgary only.

Stolata is altogether different in appearance. The secondaries are snowy white, opaque, and the primaries are straw yellow. The white median vein is well marked, as is the dark shading beneath and beyond it between veins 4 and 5.

Only the female, from "Arizona," is at hand at present.

Oregona is like a very small *pragmatidicola*, more grayish red in color and with semitransparent white secondaries, in which the veins are hardly darker, and there is only a narrow smoky border at the base of the fringes. The secondary sexual characters are much reduced in all respects. The only locality, thus far, is Corvallis, Oregon.

With *roseola* begins a small group of species in which the median vein of the primaries, though it may be white or paler, is not margined or accompanied by any dusky shading. In fact, the wings are practically uniform except for the slightly darker interspaceal streakings which are characteristic of the genus. The shadings, which are so well defined in the typical species of this series, are here reduced to vague, dusky clouds, whose location must be understood that they may be recognized. In all of them the secondaries are white, the veins hardly darkened except in the female, in which, also, there may be a slightly dusky tinge.

Roseola, as its name implies, is reddish in tint. It is like *calgariana* with all the contrasts out; but is somewhat larger and seems broader-winged than that species. It was originally regarded as a color variety of *farcta*, and has all the characters, except color, of that species. It seems to be not uncommon in the Northern Pacific States and in British Columbia.

Farcta is pale creamy yellow where the preceding is reddish, and is even larger in size. It is *anteroclara* with all the dark shadings out and the secondaries white. The sexual tuftings are very moderately developed and nowhere prominent. All examples thus far seen are from middle and southern California.

Palliseca is decidedly smaller, with narrower, more pointed wings, the primaries having lost almost all trace of maculation. The species occurs in the mountains of Colorado and in southern California; probably in the intermediate region as well.

In tabular form the species may be arranged as follows:

1. Median vein white or pale, accompanied by a black or darker shade more or less prominent, but always obvious 2
Median vein paler or concolorous, not margined by an obviously darker shade .. 9
2. Male with the anterior legs most heavily tufted; tibiæ with dense long hairy and scaly vestiture capable of fan-like and brush-like expansion 3
Male with anterior legs least modified; the tibiæ not tufted 4
3. Male antennæ lengthily ciliated; primaries creamy yellow with narrow dark streaks in the interspaces; secondaries white in both sexes .... *multilinea.*
4. Middle tibiæ of the male heavily tufted, the outer terminal spur curved and flattened, pointed at the tip; lateral ciliations of the antennæ prominent toward tip; anal tufts very large 5
Middle tibiæ of male tufted, but not prominently so; outer terminal spur short, straight, cylindrical; antennal ciliations not prominent and not longer toward tip; anal tufts moderate 6
5. Very robust, wings shorter; primaries reddish, very streaky; secondaries fuscous brown, even, leg tuftings of male discolorous .... *commoides.*
Less robust, wings longer, more pointed; primaries with narrow reddish streakings over a pale luteous base; secondaries white with a smoky outer band and veins .... *phragmatidicola.*
6. Secondaries with veins and margins obviously smoky, the female darker than the male 7
Secondaries white, the veins faintly or not at all marked 8
7. Primaries smoky gray over reddish, not obviously strigate; the white shade on the median vein obscured to near the end of cell .... *imperfecta.*
Primaries red over a luteous base, the black shade beneath the median vein very prominent .... *calgariana.*
8. Primaries straw yellow, scarcely strigate, transverse posterior line wanting; secondaries snowy white, opaque .... *stolata.*
Primaries reddish gray over yellowish; strigate; veins blackish lined; transverse posterior line punctiform, complete; secondaries semitransparent ...... *oregona.*
9. Primaries reddish, so narrowly strigate as to seem almost even; secondaries white with a yellowish tinge, the veins smoky .... *roseola.*
Primaries very pale luteous, strigate with darker luteous; size large; wings broad; secondaries white with the veins yellowish .... *farcta.*
Primaries as before, but with the markings hardly obvious; size smaller; primaries narrower, more trigonate, more pointed at apex; secondaries white ... *palliseca.*

Having given in a general way the essential characters of the groups and of the species to be referred to them, it remains to differentiate the groups before taking up the species individually.

1. Thorax with a sharp ridge or crest behind the collar, ordinary spots present on the primaries .... Group *Unipuncta.*
Thorax with a divided crest behind the collar or without obvious tufting of any kind 2

2. Ordinary spots both obvious, transverse posterior line of primaries geminate. Group *Pseudargyria*.
   Orbicular always absent; reniform reduced to a black or white dot or altogether wanting 3
3. Collar without marking of any kind .... Group *Pallens*.
   Collar white inferiorly, or at least much paler than upper half ... Group *Albilinea*.
   Collar with transverse lines of different colors, culminating in a broad purplish band below a whitish tip .... Group *Juncicola*.
   Collar with one, two, or three transverse dusky lines 4
4. Primaries narrow, elongate, apex acute, outer margin slightly excavated to vein 2, and there obtusely angulated; primaries strigate, no prominent maculation. Group *Extincta*.
   Primaries trigonate or obtuse, apex not acute, not subfalcate below 5
5. Median vein obscured by a dusky shade, marked by a white spot at its end. Group *Subpunctata*.
   Median vein white or at least concolorous, and not obscured by a dusky shade. 6
6. Rather slight, small species, vestiture with a scaly admixture; a dark shade extends through the center of the primaries from base to outer margin .... Group *Ligata*.
   Robust, stout species, vestiture hair or flattened hair; no dark shade extending continuously from base to outer margin 7
7. Primaries obtuse, broader, very much rayed or streaky; median vein white, not obviously margined by a darker shade; no black discal dot; transverse posterior line always complete .... Group *Insueta*.
   Primaries narrower, more trigonate, with marked apex; streaking not contrasting and tends to disappear; median vein, if white, marked by an accompanying dusky shade below it; if maculate at all, discal black dot is present; transverse posterior line rarely complete and tends to disappear altogether. Group *Phragmatidicola*.

LEUCANIA LUTINA, new name.

Leucania velutina SMITH, Proc. U. S. Nat. Mus., XXII, 1900, p. 480.

Ground color reddish luteous, washed with red brown, especially beyond the middle of primaries. Thorax with a narrow, sharp crest; disk carneous. Palpi reddish gray above, deep velvety brown at the sides. Abdomen washed with carmine red. Primaries with an irregular, diffuse, purplish shade along the submedian vein. Basal line vaguely indicated. Transverse anterior line narrow, single, yellowish, a little oblique outwardly to the middle, and then with a small angle a little oblique inwardly. Transverse posterior line forming an acute angle just below the costa, then evenly oblique to the hind margin; narrow, pale, margined on each side by darker red brown. Subterminal line narrow, yellowish, irregular, preceded by a few small, obscure dark spots, the terminal space a little paler than the rest of the wing. Fringes rust red. A vague dusky median shade line is marked below the cell. Orbicular moderate in size, a little irregular, annulate with yellow. Reniform of good size, oblique, oblong, sides outlined in yellow, upper and lower margins obscure. Secondaries semitransparent at base, blackish outwardly, with carmine interlined fringes and a carmine wash on the disk. Under side of body velvety dark brown. Primaries brown with a carmine wash, with a blackish discal spot and a blackish outer line. Secondaries with a carmine powdering along costal margin, apex, and half of outer margin; with a broken, dusky outer line and a narrow discal spot.

Expanse.—1.56 inches (39 mm.).

Habitat.—Biscayne Bay, Florida (Mrs. Slosson).

The species has the wing form of *unipuncta* and its general build. The markings are all very narrow, thread-like, perfectly distinct, and yet not contrasting. In color and general appearance it is entirely unlike any of our described forms, though like some of the southern species, from which it seems to be also sufficiently distinct.

The type and only specimen is a female, lacking antennæ, but otherwise in good condition.

I find that Guenée has used the name *velutina* in this genus, and am under the necessity of making a change. I have made as small a one as possible.

LEUCANIA UNIPUNCTA Haworth.

Noctua unipuncta HAWORTH, Lep. Britt., II, 1810, p. 177.

Leucania unipuncta FLINT, in Harris Inj. Ins., 1862, p. 627, figs. 274, 275, 276.—GROTE, Proc. Ent. Soc. Phila., III, 1864, p. 540.—RILEY, 2d Rept. Ins. Mo., 1870, p. 37, figs. 11, 14–16; 3d Rept. U. S. Ent. Comm., 1883, pp. 89–156.

Leucania extranea GUENÉE, Spec. Gen., Noct., I, 1852, p. 77.—WALKER, C. B., Mus., Het., IX, 1856, p. 93.—GROTE and ROBINSON, Trans. Am. Ent. Soc., II, 1869, p. 77, pr. syn.

Ground color of head, thorax, and primaries a reddish fawn gray, varying toward gray, luteous, and clearer red brown. Palpi a little darker at sides and head often a little darker in front. Collar with a pale, surmounted by a darker transverse, line. Thorax concolorous. Primaries more or less irrorate with dark or blackish scales, which increase in number and tend to darken the outer parts of the wing. Transverse anterior line not traceable or indicated by venular points. A dark point indicates the claviform. Transverse posterior line well removed outwardly, punctiform, variably evident, sometimes scarcely traceable, sometimes geminate, never very prominent. Both ordinary spots are marked as lighter shadings, but are not outlined. Orbicular oval, decumbent. Reniform irregular, marked inferiorly by a white dot at the end of the median vein, which is dusky shaded. A blackish oblique shade line extends from the transverse posterior line on vein 5 to the outer margin at the apex. Fringes short, concolorous. Secondaries smoky brown, tending to become whitish or partly translucent toward base; veins marked and discal lunule evident in the paler examples; fringes whitish or yellowish, somewhat contrasting. Beneath whitish, powdery, primaries with disk smoky and with a smoky costal spot toward apex. Secondaries with costal and outer margins powdery, darker, and with a small black discal lunule.

Expanse.—1.40 to 1.75 inches (35 to 44 mm).

Habitat.—Canada to Florida, to Texas, to the Rocky Mountains; New Mexico; Fort Collins, Colorado; Cartwright, Manitoba.

This is the most common of the species and the most widely distributed. It extends into Mexico and South America, and in our own country is of economic importance. The larva is the Army worm, and the literature is extensive. In the third Report of the Entomological Commission, above cited, the bibliography is fully given to its date. Since then it has been written about in almost every State in which it occurs.

The structural characters of the species are elsewhere referred to, and it remains only to be said that the actual range of variation is not great—chiefly a matter of lighter or darker.

The species occurs throughout the year, but becomes most abundant in September, when it often drives off every other species from sugar.

LEUCANIA PSEUDARGYRIA Guenée.

Leucania pseudargyria Guenée, Spec. Gen., Noct., I, 1852, p. 74.—Caulfield, Can. Ent., VI, 1874, p. 132, larva.—Speyer, Stett. Ent. Zeit., XXXVI, 1875, p. 113.—French, Can. Ent., XIII, 1881, p. 24, larva.

Mythimna pseudargyria Walker, C. B., Mus., Het., IX, 1856, p. 77.

Leucania pseudargyria, var. *callida* Grote, New List, 1882, p. 30, note.

Ground color grayish luteous, tending to reddish. Head sometimes rusty brown in front and occasionally the inferior half of the collar is also rusty; but usually it is concolorous. The little tuft behind the collar is sometimes rusty, but more usually concolorous. Primaries very finely speckled with smoky, blackish, or reddish. Transverse anterior line often reduced to black points on the veins or black lunules in the interspaces; when best defined the venular dots are obvious and the outcurves in the interspaces are wide. Transverse posterior line is usually a very even series of venular dots, almost rigidly parallel with the outer margin; sometimes the line is geminate and an inner line of dots parallels that already mentioned; but this inner line is rarely complete and tends to become irregular. There is a series of small terminal dots in the interspaces. The ordinary spots are both obvious, paler than the rest of the wing, not outlined. Orbicular round or nearly so, varying in size. Reniform moderate or rather small, vague, kidney shaped with a small black dot at the end of the cell. The terminal area is slightly darker in most examples. Secondaries from pale smoky to black, the fringes lighter, else nearly uniform. Beneath obscure smoky, yellowish, the primaries darker on the disk, with a blackish costal spot from which a punctiform line sometimes crosses the wing. Secondaries paler, sometimes immaculate, sometimes with a discal dot, and sometimes with a series of venular dots forming an exterior line.

Expanse.—1.30 to 1.85 inches (33–46 mm.).

Habitat.—Canada, July and August; New Hampshire, July; New Jersey, April, May, June, July; New York, May to August; Cleveland, Ohio, in June; Glenwood Springs, Colorado, in April.

As a whole this common species occurs east of the Rocky Mountains and does not seem to extend into the Southern States. The sexual structures have been sufficiently noted elsewhere. The males are uniformly larger than the females and sometimes the disproportion is very striking.

Besides this variation in size there is a difference in color, the tendency being to a reddish tint. The distinctly red form Mr. Grote named *callida*, and comparing it with Guenée's *obusta* in the British Museum, I concluded that the two were identical. The species was described as from America, and Walker credits it to the United States, from Doubleday. Mr. Grote, in 1882, referred it somewhat doubtfully as a synonym of *pseudargyria*, and I saw no reason to differ with him. Now Sir George Hampson declares that Guenée's species is from Tasmania; hence should not be associated with the American form. I therefore restore Mr. Grote's term *callida* to indicate the red form of *pseudargyria*.

LEUCANIA PILIPALPIS Grote.

Heliophila pilipalpis GROTE, Proc. Bost. Soc. Nat. Hist., XVIII, 1875, p. 415.

"A male specimen having the facies and ornamentation of *pseudargyria* Guen., but without the exaggerated tufting of abdomen and tibiæ. Stout, with hairy eyes and smooth front, and with a curious fan-shaped tuft of spreading hair arising from the upper surface of the second joint of the unusually prominent palpi. Head, thorax, and anterior wings concolorous, fawn gray, like pale specimens of its ally. Forewings sparsely speckled with black. Median lines fragmentary, composed of black marks; transverse anterior line outwardly oblique, subobsolete. Cell shaded with black. Orbicular spot wanting. Reniform, narrow, pale, S-shaped, intersecting inferiorly the black discal shade. Transverse posterior line formed of double dots, connected as in *pseudargyria*, but the line is more oblique and inwardly removed. Fringes pinkish, as is the internal margin, the latter showing an accumulation of the black irrorations. Hind wings whitish, with a smoky clouding outwardly above vein 2. Beneath whitish, without markings, with the fringes on fore wings pink, and the black transverse line visible on costa."

Expanse.—1.72 inches (43 mm.).

Habitat.—Appalachicola, Florida (Thaxter).

Since seeing the original type of this species I have seen only one other example of this species, a female, which, through the courtesy of Mr. Schaus, is now before me. It is in poor condition, but undoubtedly this species. Compared with the description of the male, the transverse anterior line is less obvious and the reniform is not S-shaped. Otherwise the agreement is close.

The palpi in the female are unusually long and slender for a member of this genus, are closely clothed, and without special modification.

LEUCANIA SUBPUNCTATA Harvey.

Heliophila subpunctata Harvey, Bull. Buff. Soc. Nat. Sci., III, 1875, p. 8.
Leucania subpunctata Smith, Bull. 44, U. S. Nat Mus., 1893, p. 189.
Leucania complicata Strecker, Lep. Rhop. and Het., Suppl., I, 1898, p. 9.

Color a dull, grayish red-brown over a yellowish base. Head with two darker transverse lines on front. Collar with three lighter and three smoky lines alternating. The patagiæ are much powdered with blackish. Primaries with a dark smoky or blackish shade over the median vein, relieving a white dot at its end and extending beyond it nearly to the transverse posterior line. In the costal region the veins are whitish, the interspaces streaked with blackish. Along the inner margin is a paler, more yellowish area in which the streakings are lighter. The terminal area is dark, limited above by a somewhat yellowish oblique subapical shade. Transverse posterior line punctiform, complete. Secondaries white, somewhat translucent, veins and outer border smoky. Beneath, primaries smoky with a reddish tinge; a black spot on costa toward apex from which a smoky line may extend across the wing. Secondaries whitish, with the costal and outer margins more or less obviously reddish gray, powdery.

Expanse.—1.35 to 1.52 inches (34 to 38 mm.).

Habitat.—Agricultural College, Mississippi, in October; Harris County and elsewhere in Texas in March; New Mexico, near its southern border.

This seems to be locally common in Texas; but it was many years before I had an example in my collection. At present I have eleven specimens, representing both sexes, and except for size and for a little lighter or a little darker general effect there is no variation.

The structural features and other distinctive characters are elsewhere referred to.

Complicata Strecker was described from a rather small New Mexican specimen before the species had turned up in large numbers in Texas.

LEUCANIA LUTEOPALLENS, new species.

Leucania pallens Speyer, Stett. Ent. Zeit., XXXVI, 1875, p. 112, and of American authors generally.

Ground color a creamy yellow, the primaries with the veins paler, the interspaces with somewhat more luteous streakings. Head, collar, and thorax immaculate. The median vein and its lower branches at the end of the cell tend to paler, and a slightly darker shade is usually noticeable below the median. A black discal dot at the end of the cell. Transverse posterior line reduced to two black dots. Secondaries white, the veins on disk and a small area of the disk itself tinged with blackish. Beneath yellowish white; primaries with a blackish streaking at the end of the cell and an outer dusky venular band; secondaries with a tendency to a dotted outer line, which is rarely complete and may be entirely wanting.

Expanse.—1.20 to 1.36 inches (30 to 34 mm.).

Habitat.—Canada to Florida; Elizabeth, New Jersey, May and June; Anglesea, New Jersey, in April; Archer, Florida, in March.

Twenty or more examples are before me from almost every North and Middle Atlantic State, but only on a few are there dates of capture.

The sexual and other distinctive characters have been already pointed out, and the range of variation is not great. There is a little difference in depth of ground color, in the relative distinctness of the strigation, and in the amount of black on the disk of the secondaries; otherwise the specimens run very even.

It is probable that the species extends to the Mississippi Valley, and perhaps to the elevated plains beyond.

Type.—No. 6244, U.S.N.M.

LEUCANIA MINORATA Smith.

Leucania minorata Smith, Trans. Am. Ent. Soc., XXI, 1894, p. 75, pl. v, fig. 11.

Ground color grayish luteous, head and collar sometimes obscurely darker, immaculate. Primaries quite obviously strigate, the veins paler, the interspaces with one or two or three decidedly darker strigæ in the interspaces. There is always an obvious though not contrasting shade beneath the median vein, usually a smoky, curved shade on the inner margin near base, and quite frequently a decidedly blackish line between veins 5 and 6. A black dot at the end of the discal vein. Two black dots represent the remnants of the transverse posterior line. There is a series of minute black terminal dots, which may be obsolete. Secondaries with disk smoky, the margins whitish. Beneath, primaries with a larger or smaller part of the disk smoky, a more obviously blackish shading at the end of the cell. Sometimes with an indicated punctiform outer line. Secondaries white with a small black discal dot.

Expanse.—1.20 to 1.35 inches (30 to 34 mm.).

Habitat.—San Francisco, California; Corvallis, Oregon, May 20, June 12, August 24, September 17; Corfield and Livingston, Vancouver, throughout July to August 12; Calgary, Alberta, June 24 to July 30.

Eighteen examples are under examination. The term *minorata* is a misnomer, if this species is to be compared with *luteopallens*, but I considered it nearer to *oxygale* in the original description. As a matter of fact, it stands between *oxygale* and the European *pallens*, being really the American representative of the latter species.

The range of variation, except in size, is small. It is a matter of little more contrast on the primaries between the lighter and darker streakings; a little more or a little less blackish on the secondaries.

On the under side the range of variation is greater, no two examples being quite alike in the amount of black on primaries. In this point also the species agrees well with *pallens* rather than *luteopallens*.

LEUCANIA OXYGALE Grote.

Heliophila oxygale Grote, Can. Ent., XIII, 1881, p. 14.
Leucania oxygale Smith, Bull. 44, U. S. Nat. Mus., 1893, p. 185.

Ground color a very pale creamy, overlaid with gray, giving the impression of a pale luteous gray or dirty pale clay yellow. Head and thorax immaculate. Primaries with the veins paler and the usual dark strigations in the interspaces, but so little contrasting that the wings seem almost immaculate. The median vein is only a little paler and the dot at the end of the cell is very small or altogether wanting. So the transverse posterior line consists at most of two black venular points, and may be altogether wanting. Secondaries either uniformly smoky, or the margins may be paler and the veins darker; always with a large area of the disk blackish. Beneath, white, more or less black powdered or with smoky suffusion. The primaries may be blackish, except at the margins, and they may be black shaded only over the discal area at the end of the cell. Secondaries usually with only a light powdering of blackish scales, a small black discal dot, and a narrow, yellowish-tinted marginal area; rarely a large part of the discal area is blackish.

Expanse.—1.25 to 1.40 inches (31 to 35 mm.).

Habitat.—Alameda County, California, in June (Koebele); Los Angeles, California, May 15 (Smith); Palo Alto, California, April 30, Middle California (Barnes); Sierra Nevada, California (Hy. Edwards); Beulah, New Mexico, July 14, 18 (Cockerell); Salt Lake Utah (Hy. Edwards); Denver and Glenwood Springs, July 1 to 7, Colorado (Barnes).

Fourteen examples are under examination. It is the least contrasting of the species in this group, and the least variable in consequence. The black dots on the primary are never very strongly marked, but any one or all of them may be absent. Some specimens have quite a clear creamy-yellow tint, but the majority has a dirty gray addition that dulls the color.

While the range in size brings this species only a little above *minorata*, yet, as a matter of fact, most of the specimens exceed 1.30 inches and nearly or quite reach 1.35 inches, while in *minorata* the smaller number reach 1.30 inches, and very few indeed exceed it.

LEUCANIA RUBRIPALLENS, new species.

Ground color dull reddish luteous. Head and thorax immaculate. Primaries with the streakings well marked, though not much contrasting; median vein usually relieved by a darker shade beneath it. Discal black dot very small or entirely absent. The two dots indicating the transverse posterior line are usually traceable, never prominent, and often entirely absent. Secondaries yellowish in tinge, ranging to a transparent smoky, the disk being always a little darker. Beneath much paler than above; primaries with the disk variably blackish, ranging from a little shading over the cell to nearly the entire surface. Secondaries more or less powdery along the costa, and a little on the outer margin, with a small discal dot on a majority of the specimens before me.

Expanse.—1.25 to 1.40 inches (31 to 35 mm.).

Habitat.—Sierra Nevada, California (Hy. Edwards); Salt Lake, Utah (Hy. Edwards); Utah in July (Poling); Denver, Colorado, June 10 (Oslar); Glenwood Springs, Colorado, June 24, July 10, 16, and August 24 (Barnes).

Eleven examples are before me, and they vary little except in the depth of the red tinge and in the amount of black on the secondaries. On the underside there is the usual range of variation as to area covered by black shadings and powderings, but nothing else.

The average size of the specimens is 1.30 inches, three examples—females—exceeding that materially, while only two fall much below it.

Type.—No. 6246, U.S.N.M.

LEUCANIA PERTRACTA Morrison.

Heliophila pertracta Morrison, Proc. Bost. Soc. Nat. Hist., XVIII, 1875, p. 120.
Leucania pertracta Smith, Bull. 44, U. S. Nat. Mus., 1893, p. 186.

"Eyes hairy. Head and thorax concolorous with the anterior wings. The latter are uniform yellowish salmon color, interrupted only by the median vein, which is white, as well as its second and third branches; the apical costal branches are also whitish. Posterior wings and under surface white, immaculate."

Expanse.—34 mm. Length of body, 16 mm.

Habitat.—Philadelphia, Pennsylvania.

I have already recorded my convictions as to this species; but give the above copy of the original description, since, after all, the insect may be American, though not, I am convinced, a native of Pennsylvania.

It is obviously a member of this group and quite out of the range of variation for *luteopallens*. The primaries are like *rubripallens*, but the white secondaries and underside bar it. If the same form does ever again turn up, there will be no difficulty in recognizing it.

LEUCANIA RUBRIPENNIS Grote and Robinson.

Leucania rubripennis Grote and Robinson, Trans. Am. Ent. Soc., III, 1870, p. 179, pl. II, fig. 77.

Ground color a creamy, varying to pale lemon yellow, shaded with pinkish carmine, varying in depth. The carmine shading on primaries begins on the costal region before the middle, is very slight to apical third, broadens there, but narrows again so as to leave the apex clear. Below the median vein, which is paler and may be white, the carmine fills half the submedian interspace to vein 2, and all the space between veins 2 and 3. Veins 3 and 4 are pale, and the space between them is usually more or less completely pale; but it may be entirely reddish. Above vein 4 a carmine shade begins at the end of the cell as a point and broadens out so as to reach the outer margin below the apex. No black points or dots on any of the specimens before me. Secondaries white, sometimes with the margins a little soiled. Beneath white, primaries with a pinkish or yellowish shade. Head with a rusty yellow shading in front and sometimes with a rusty line above the antennæ. Collar of the palest ground color inferiorly, rusty above and on the disk behind the collar. The front of the breast is also rusty or reddish.

Expanse.—1.34 to 1.50 inches (34 to 38 mm.).

Habitat.—Texas in August; Kansas City, Missouri, in August (Hall).

Six examples are under examination, and I have seen others. The species must be locally and seasonally common, for Belfrage seemed to have taken it in numbers; but since his time very few examples have found their way into collections. In 1898 Mr. F. J. Hall, by taking the species near Kansas City, Missouri, extended its known distribution materially; but I have no data as to how frequently it is captured there.

There is little observed variation, and the insect is altogether so well marked that no difficulty will be found in identifying it.

LEUCANIA ALBILINEA Hübner.

Leucania albilinea Hübner, Zutraege, Ex. Schmett, 1816, p. 25, No. 169, figs. 337, 338; Verzeichniss, 1816, p. 241.—Guenée, Spec. Gen., Noct., I, 1852, p. 89.—Walker, C. B., Mus., Het., IX, 1856, p. 99.—Riley, 9th Rept. Ins. Mo., 1877, p. 50, figs. 14, 15, all stages.—Grote, Can. Ent., XII, 1880, p. 116.

Leucania harveyi Grote, Bull. Buff. Soc. Nat. Sci., I, 1873, p. 9, pl. I, fig. 14.—Harvey, Bull. Buff. Soc. Nat. Sci., III, 1876, p. 8.—Grote, Can. Ent., XII, 1880, p. 116, an sp. dist.—Smith, Bull. 44, U. S. Nat. Mus., 1893, p. 186, pr. syn.

Ground color a dirty luteous, more or less smoky, varying in depth. The head tends to become rusty yellow in front. Collar whitish inferiorly, the paler shade crossed by a narrow brown line. A black or brown line surmounts the whitish area and shades into the ground color at tip. Patagiæ with a more or less obvious white line and the disk behind the collar a little white. Primaries with the brightest pale color extending from base through the cell to the apex. A similar, more irregular area of bright shade extends along the inner margin. Costal area from base nearly to apex gray, or brown streaked, not contrasting, but in contrast to the even lighter shade below it. Median vein white or at least pale, the light shade continued on veins 3 and 4 to the margin; not unusually the interspace between these veins is paler than the area above or below. A brown shading below the median vein extends at least to its end and usually to the outer margin; often the vein is inferiorly edged with black. A black narrow line extends from base into the submedian interspace and forms a loop near the middle of the wing, suggesting a claviform. Above vein 4 there is a triangular dusky area which, on the outer margin, reaches almost to the apex. The terminal space may be leaden gray or concolorous, or there may be a series of black marks indicating the subterminal line. There may be a small or a large black discal dot or none at all. It may break up into two of equal or unequal size or even into three, and these indicate the reniform. Fringes usually darker, with a pale line at base. Secondaries smoky brown or blackish, even or only a little paler at the base; fringes white. Beneath, powdery gray over dirty white, the secondaries paler; the dark shading variable, forming no obvious markings.

Expanse.—1.12 to 1.32 inches (28 to 33 mm.).

Habitat.—Anglesea, New Jersey, June 10, September 3; Cleveland, Ohio, May 5, 9 (Kearfott); Glenwood Springs, Colorado, June 5 (Barnes); southern Arizona (Barnes).

The above are specific localities referring to the fourteen examples now before me. It is probable that the species occurs throughout the Eastern United States and extends into Canada. It is not impossible that the south Arizona example may represent a good species. The single specimen is only enough to create a doubt. The majority of specimens expand about 1.20 inches.

I have carefully compared Hübner's figure and have matched it perfectly in the series before me. I have little doubt that it is this species really, though the type was said to come from Buenos Ayres. Hübner's description does not help much; he says it is a *noctua genuina* and *Heliophila pallida.* To *Leucania l–album* it is rather similar, but has an entirely unique middle marking besides other variations.

On the other hand there is no doubt but that Mr. Grote intended the form here treated when he described his *harveyi.* The description fits it perfectly and fits no other.

The range of variation has been partially indicated in the description; it is not really great and yet there is enough to make quite a little difference in appearance. In the one extreme there are no black streaking and no discal dots; in the other there is black everywhere, below the cell, even in the cell; the discal spot breaks up and in every interspace along the subterminal line is a black mark or streak.

The species has a large economic bibliography which is not here referred to. The larva is known as the wheat-head army worm.

LEUCANIA OBSCURIOR, new species.

Resembles *albilinea* in general type of maculation, but is somewhat darker on the whole, with less contrast, the ornamentation much more even. The median vein is white, the shading below it does not usually differ very greatly from that along the inner margin; but on the other hand there is a shading above the vein, continuous with the trigonate shading above vein 4. In only one example is a discal dot observable. Secondaries white at base with a smoky tinge outwardly. Beneath whitish, with a distinct yellow tinge over the costal region.

Expanse.—1.20 inches (30 mm.).

Habitat.—Cartwright, Manitoba (Heath).

Two males and two females only, all very much alike and all more or less imperfect. The material is scant to authorize a new species in this group; but the combination of dark primaries, like those in *albilinea* with pale secondaries, leads to the belief that with more material additional points of difference will be brought out. Meanwhile it is at least a well-marked local form.

Type.—No. 6246, U.S.N.M.

LEUCANIA DIFFUSA Walker.

Leucania diffusa WALKER, C. B., Mus., Het. IX, 1856, p. 94.—DRUCE, Biol. Cent. Am., Het., I, 1889, p. 262, pl. XXVI, fig. 10.

Leucania albilinea GROTE, Ill. Essay, 1882, p. 42.—SMITH, Bull. 44, U. S. Nat. Mus., 1893, p. 186.

Leucania moderata WALKER, C. B., Mus., Het., IX, 1856, p. 114.—SMITH, Bull. 44, U. S. Nat. Mus., 1896, p. 186, pr. syn.

Ground color a very pale luteous, tending to whitish. Head with a more or less obvious rusty tinge. Pale portion of collar with a brown or blackish transverse line, the tip rusty over a black line. Patagiæ with a white line on disk and on the thorax a white line behind the collar. Primaries as a whole have the region along the inner margin broadly pale; in the male the costal region is usually as light; in the female it is gray with a pinkish tinge. A loop-like claviform is more or less completely indicated in every specimen, and is attached to a narrow black basal streak. The white median vein is usually black margined beneath, and below this is a gray or brown shading. A black discal spot is present in all the specimens, and often there are two. The terminal space is usually gray or brown, and the usual triangular shading above vein 4 is well marked, though not so broad as in *albilinea*. The fringes are of the pale ground and usually have a still paler line at base. Secondaries white, becoming smoky at the outer margin, varying in this particular. Beneath white, more or less powdery; primaries with the costa broadly yellowish or creamy, the disk tending to blackish.

Expanse.—1.15 to 1.38 inches (29 to 35 mm.).

Habitat.—Nova Scotia (Walker); New Hampshire; Newton, Massachusetts; Torrington, Connecticut; Newark, May 5, August 17, and Montclair, New Jersey, August 4 (Kearfott); Anglesea, New Jersey, August 21 (J. B. S.); Iowa City, Iowa, July 29 (Wickham); Mesilla

Park, New Mexico, April 4 (Cockerell); Shovel Mountain, Texas (Barnes); City of Mexico (Druce).

Specimens from all save the first and last of the above-cited localities are at hand, with a few others that have State labels only. The range extends, therefore, from the boreal area to the Tropics, though probably not to the real tropical fauna.

In the comments on *albilinea* I referred to the fact that a large economic literature exists for that species. It is not improbable that in great part the species now under consideration is really intended, hence citations must be cautiously made. It is also highly desirable that systematic breeding be done to discover the range of variation and what, if any, differences are discoverable in the larva.

L. moderata Walker, was described from "locality unknown;" but the type in the British Museum seemed to me American and like *diffusa;* so the reference was made.

The range of variation is very like that in *albilinea*, but not so great in contrast. In every respect the insect looks and is paler. When once the attempt is made to separate out, there is no difficulty in arranging the series.

LEUCANIA LIMITATA, new species.

Very pale creamy yellow. Head a little rusty in front. Collar gray rather than white inferiorly, limited by a white, surmounted by a black line. Primaries without costal darker shading. Median vein white, margined above by a smoky brown line which beyond the cell enlarges into the usual trigonate shading. Below the median vein is a narrow yellow brown shade, the vein itself black edged near the end. A small black basal streak with a very narrow loop-like claviform. Terminal space a little darker. Secondaries white, immaculate. Beneath white or a very little yellowish, the costal region a little darker.

Expanse.—1.32 inches (33 mm.).

Habitat.—Texas, in June (Hulst coll.).

Only a single male in fair condition. It is unfortunate that no greater material of this species should be available to bring out more clearly what differences exist.

LEUCANIA TETERA, new species.

Ground color a pale creamy yellow. Head dull luteous. The white portion of collar crossed by a narrow luteous line; no defining line between the pale lower and darker upper portion. Thorax dull luteous. On the primaries the costal region becomes shaded with pink toward the apex. A small black discal dot. The usual dusky shade above vein 4, but interrupted by two white, black-edged dotlets in the interspaces, marking the subterminal line. Median vein concolorous until near its tip, then whitish and opening into the 3–4 interspace. Below the median vein is a dusky shading, blackish at base and end of median vein, gray and reddish luteous beyond and below. The claviform barely traceable. Terminal space leaden gray except at apex. Subterminal line marked by black scales or by paler, black-margined points. A small black discal dot. Fringes white, with a yellow line at base and two narrow blackish interlines. Secondaries white, pearly, semitransparent. Beneath, primaries pale creamy, tending to pinkish along the costa; secondaries pearly white, tending to creamy along the costa.

Expanse.—1.16 to 1.28 inches (29 to 32 mm.).

Habitat.—Wilgus, Cochise County, and southern Arizona (Barnes).

Three male examples, two of them in fair condition. They are very much alike and there is no doubt as to the distinctness of the species. The genitalic differences have been already referred to, as have the superficial color characters. The anterior femur has larger tufts than usual in this group and the fore tibia is also well tufted. On the middle and hind legs the tuftings, while well developed, are not especially prominent.

Type.—No. 6247, U.S.N.M.

LEUCANIA NEPTIS, new species.

Ground color a dull, lifeless, very pale yellow; the dark shadings on the primaries are an equally lifeless yellow or smoky brown. Head tending to rusty brown. Thorax dull luteous; a white line separating the pale from the dark portion of the collar. Primaries with all save internal and median veins dusky; breaking up what in other species is the clear sweep of the paler shade to the apex. The usual trigonate shade above vein 4. The dusky shade below the median shade merges gradually into the paler ground. A small black basal dash; but in few instances can the claviform be traced. Terminal space dusky. Discal dot absent or reduced to a mere point. Fringes whitish with two dusky interlines. Secondaries white with a faint yellowish tint. Beneath very pale yellowish; primaries deeper tinted and more yellowish along the costal region.

Expanse.—1.20 to 1.40 inches (30 to 35 mm).

Habitat.—Colorado (Neumoegen); Fort Collins, Colorado, August 13 (Kearfott).

Nine examples are before me, eight of them from badly papered specimens. One perfect example from the Neumoegen collection.

There is an undescribable lifeless shade to all these examples, giving no contrast, no defined impression—all one dull sameness.

The leg tuftings in the male are better developed than in other species of the group save *tetera.* In *neptis* the anterior leg is not materially more prominent than the others.

I have little doubt as to the specific standing of this form.

Type.—No. 6248, U.S.N.M.

LEUCANIA LIGATA Grote.

Heliophila ligata GROTE, Trans. Am. Ent. Soc., V, 1875, p. 115.
Leucania ligata STRECKER, Rept. Chief Eng., 1878–79, V, 1879, p. 1862.

This slender species has pure white secondaries and fringes in the female, while in the opposite sex these are slightly soiled. Forewings whitish ocher gray, faintly purple tinged, with the veins obsoletely white marked and accompanied by longitudinal blackish shades. Median nervure covered by a whitish streak, culminating in a white spot relieving a single inferior black dot and accompanied by a black shading which continues diffusedly to external margin, and leaves a clear ochery space above it on the cell, reaching beyond the dotted transverse line. Transverse posterior line indicated by a series of black venular points. Very minute marginal black points; fringes a little paler than the wing. Thorax and head like primaries. Beneath, without discal dots or common lines; a terminal dotted line on both wings; primaries and costal region of secondaries somewhat rosy gray, else the secondaries are whitish, subpellucid. Under surface of body and legs of a slightly rosy gray. Collar faintly lined.

Expanse.—1.10 to 1.22 inches (27.5 to 30.5 mm.).

Habitat.—Texas, March to November; Florida in March; Colorado, July 31.

Twelve examples are before me, mostly from Texas; Shovel Mountain and Harris County being the only specific localities. The above is practically Mr. Grote's description, not in quotation marks, because not literally transcribed.

In general, there is a decided reddish gray tinge, a coarse black powdering, an obvious dotted transverse posterior line, and a longitudinal dark streak which extends over the white marked median vein from base, beyond it to the transverse posterior line or even the outer margin. The secondaries are rarely immaculate, but may be so in either sex; nor, on the other hand, is the smoky outer margin very extensive in any case seen by me. The species does not seem to be rare in Texas and tends to lose the reddish or purplish tinge.

LEUCANIA FLABILIS Grote.

Heliophila flabilis GROTE, Can. Ent., XIII, 1881, p. 15.
Leucania flabilis SMITH, Bull. 44, U. S. Nat. Mus., 1893, p. 189.

Very pale ochery or straw color, shaded with fuscous. The pale longitudinal shades extend along the cell over the interspaces between veins 5 and 6, nearly to the margin. A short pale shade on the interspace above and extending nearer the margin. From the base a wide submedial shade extends outwardly to the margin. A black dot marks the reniform at median vein; an extra-mesial row of dots on the nervules, not prominent. The veins are indistinctly paler. The darkest portion of the wing is along the median vein, and a fine black streak runs along the interspace between veins 4 and 5. Hind wings whitish, vaguely soiled with fuscous exteriorly. Thorax concolorous with primaries; no lines on the collar. Beneath without marks. This species recalls in maculation *lapidaria*, but is more diffusely shaded, the spots of the outer line more numerous, the hind wings darker, the body more slender.

Expanse.—1.32 inches (33 mm.).

Habitat.—Long Island, near the seashore, in May.

The species was taken by Mr. Fred. Tepper who had a cotype, and this is the only example of *flabilis* known to me in any American collection. It is probable that the insect is very local and that may account for its absence in cabinets. I have already stated that I can see no difference between *ligata* and *flabilis* except that the latter lacks the purplish shading. But the Tepper specimen has a purplish tinge, and I have a Texas example that has as little. An expanse of 33 mm. is too great for the cotype and too great for any *ligata* known to me.

The description is essentially that originally given by Mr. Grote.

LEUCANIA RIMOSA Grote.

Heliophila rimosa Grote, Can. Ent., XIV, 1882, p. 216.
Leucania rimosa Smith, Bull. 44, U. S. Nat. Mus., 1893, p. 189.

Fore wings hoary gray, something like *ligata* in color; irrorate with dark speckles and with a faint warm shade, reminding one a little of *unipuncta* in these respects. Allied to *commoides;* no lines or spots visible except that there is continuous series of excessively minute subterminal dots, and the median vein is faintly marked with white and edged with black; the white color accentuated at base of third and fourth median nervules. Hind wings pale gray, whitish, veins soiled. Beneath a blackish shade marks the inception of the subterminal line on costa, and the median vein is shaded at base of nervules. Hind wings with costa darker; no lines or spots. Face and pectus a little smoky; fore tibiæ pale outwardly. Thorax gray; abdomen paler.

Expanse.—1.36 inches (34 mm.).

Habitat.—Kittery Point, Maine.

No one has taken this species save Dr. Thaxter, so far as I am aware, and the original type is with him. A second specimen which he kindly sent me is smaller—only 31 mm.—and the longitudinal shading through the center of the wing is quite obvious though not conspicuous. I can not find anything to suggest *commoides*.

LEUCANIA DIA Grote.

Heliophila dia Grote, Can. Ent., XI, 1879, p. 29; Ill. Essay, 1882, p. 56, pl. II, fig. 19.

Leucania dia Smith, Bull. 44, U. S. Nat. Mus., 1893, p. 187.

Ground color a pale reddish gray. Head and fore breast smoky tinged. Collar with a somewhat darker line across the middle. Thorax concolorous. Primaries without strong contrasts. Veins white-marked or at least paler, the costal region gray or whitish. Interspaceal rays not prominent or contrasting. Transverse posterior line punctiform. A series of very small terminal, interspaceal dots which may be wanting. A narrow pale line at the base of the fringes. Secondaries dirty whitish, almost uniform, veins a little darker. Beneath, primaries pale reddish gray, costal region whitish to a dusky blotch about one-fourth from apex. Secondaries whitish, powdery, a little darker and more powdery over the costal area.

Expanse.—1.16 to 1.24 inches (29 to 31 mm.).

Habitat.—California; Oregon.

Three males and one female are before me. One of these agrees perfectly with Mr. Grote's description. The second is more reddish and a little larger and agrees better with the picture in the "Illustrated Essay." The others, from "Middle California," are somewhat darker and have the interspaceal streaking much better marked. The character emphasized by Mr. Grote in his description, i. e., the absence of a dusky shading along the median vein, loses force here, because, while it is by no means prominent, there is undoubtedly a smoky line on each side of the vein. The triangular dusky shading in the terminal area of the wing is also well indicated here.

The heavily clothed quadrate thorax, as against the short, obtuse wings, gives the insect a peculiarly stumpy appearance.

LEUCANIA MEGADIA, new species.

Ground color a dirty reddish gray, tending to smoky. Head varies to rusty or smoky, as does the forebreast. Collar with a blackish central line. Thorax concolorous. Primaries with veins white, interspaceal streaks obvious and tending to become black beyond the transverse posterior line. The latter is punctiform and well marked. Median vein margined by smoky shadings above and below, forming a more conspicuous white dot at its end and usually emphasized there by black scales. A distinct black or blackish basal streak in the submedian interspace. The costal region is usually paler gray. In the terminal area of the wings the dusky shadings are so disposed as to form a more or less obvious dark area over the internal angle and a trigonate shading below the apex. Secondaries smoky yellowish, nearly uniform. Beneath, primaries smoky reddish gray, disk darker and at outer fourth a variably marked dusky costal spot; secondaries paler, the costal region black powdered.

Expanse.—1.12 to 1.36 inches (28 to 34 mm.).

Habitat.—Calgary, Alberta, June 15 to July 20; Oregon (Koebele); Pullman, Washington, May 25 (Piper); Nevada County, California (Koebele); Yellowstone Park, Wyoming, July 10; Denver, Colorado, June 30; Chiricahua Mountains, Arizona, July 4 (?).

This species has the body less robust and the wings broader than in *dia*, hence it looks decidedly larger, an appearance which was not borne out on actual measurement in all cases. The average runs only 1 or 2 millimeters larger.

Sixteen examples, varying in distinctness; the Calgary specimens are probably all from Mr. Dod, the Yellowstone example is from Dr. Barnes. One example from Calgary is almost as even in color as *dia*, but has the black basal streak obvious. This latter feature will serve to distinguish the two small species in the group without difficulty.

There is a decided tendency to a red shading and one specimen is as red as any *insueta* I have ever seen, the costa in this case being almost white. The single example from the Chiricahua Mountains is a female and in such condition that the reference is not positively made.

Type.—No. 6249, U.S.N.M.

LEUCANIA HETERODOXA Smith.

Leucania heterodoxa Smith, Trans. Am. Ent. Soc., XXI, 1894, p. 75, pl. v, fig. 7.

Ground color a dirty luteous gray with a varying reddish tinge. The head may be either a little lighter or a little darker than the ground color. The tuftings of the front legs in the male are conspicuously darker. Collar with a dusky or black median line either relieved by paler lines above and below, or with a second, less conspicuous line just below tip. Disk of thorax and patagiæ powdery, the latter tending to a marginal line. Primaries obviously and often conspicuously streaked in the interspaces; the veins white or whitish. Median vein white, forming a white spot at its end, margined by a darker shading. The costal region is paler, sometimes a little contrasting, until just before the apex. The transverse posterior line is a series of black venular dots, evenly curved and nearly parallel with the outer margin. The dark shadings in the wing are above the anal angle and from the transverse posterior line on vein 2 or 3, obliquely to the apex. In some examples there is a costal shade before the apex and in some cases the apex is dusky. There is a series of small terminal black dots. The fringes are dusky and have a pale line at base. Secondaries smoky or fuscous, fringes paler. Beneath powdery, varying in tint. Primaries are from reddish gray to smoky and have a blackish costal spot toward apex. Secondaries are whitish, becoming more powdery and more reddish in the costal region.

Expanse.—1.28 to 1.40 inches (32 to 35 mm.).

Habitat.—Pullman, Washington, May 25, June 10 (Piper); Corvallis, Oregon, May 1 to June 6 (Cordley); Corfield, Vancouver; Nevada County, California (red number 342 Koebele); Denver, Colorado, June 30; Boulder, Colorado, August 10; St. Anthony Park, Minnesota, June 25 (Lugger); Sierra Nevada, California; Laggan, British Columbia, 5,000 feet, July 2.

A long series of examples is before me from all save the last two mentioned of the above localities. It establishes the species and illustrates its range of variation, which is narrow. There is a very slight tendency to a reddish tinge, but nothing to cause confusion with *insueta*, from which this species is also well separated by the absence of a black basal streak. In some examples the indications of such a streak may be made out by close scrutiny, but I have never found a case where there was enough to give any reason for hesitation.

Aside from this it is a mere matter of lighter or darker, or more or less contrast, and this seems to depend somewhat on the age of the specimen.

The sexual and other structural characters have been elsewhere defined.

LEUCANIA INSUETA Guenée.

Leucania insueta Guenée, Spec. Gen., Noct., I, 1852, p. 81.—Walker, C. B., Mus., Het., IX, 1856, p. 95.—Smith, Bull. 44, U. S. Nat. Mus., 1893, p. 188.
Leucania commoides Grote, Can. Ent., IX, 1877, p. 28.
Heliophila adonea Grote, Bull. Buff. Soc. Nat. Sci., II, 1874, p. 159.—Smith, Bull. 44, U. S. Nat. Mus., 1893, p. 188, pr. syn.
Leucania mimica Strecker, Lep. Rhop. et. Het., Supp. II, 1899, p. 6.

Ground color a pale reddish luteous. Head a little lighter or a little darker, but always uniform. Collar with a smoky or blackish central line. Thorax more reddish gray, speckled lightly with black. Primaries streaked and shaded with brick red or even darker red brown. Costal region always paler and sometimes white. Veins white, or at least paler. Median vein white, enlarging into a little spot at its end, shaded on each side so as to darken the center of the wing. A short black basal streak in the submedian interspace. A shorter dark brown or blackish streak on the hind margin near base. Transverse posterior line black, punctiform, evenly curved. An oblique brown shade over the anal angle and a second from vein 2 at the transverse posterior line to outer margin below apex. The white veins are often a little expanded at the base of the fringes. Sometimes a series of small terminal black dots, rarely an almost continuous brown line; often neither. Secondaries whitish or yellowish at base, darkening outwardly to smoky or blackish; fringes with a yellow line at base. Beneath, primaries reddish gray, powdery, with a smoky costal dot from which starts a variably complete punctiform extra median line;

secondaries whitish, except in apical and costal region, with a more or less complete, punctiform extra median line.

Expanse.—1.24 to 1.44 inches (31 to 36 mm.).

Habitat.—Nova Scotia; Canada in July; New York, June to August; Newton, Massachusetts; Missouri; Glenwood Springs, Colorado, September 1 (Barnes).

This is a common species, hence my material is not especially good There are twenty or more specimens, but not well distributed as to locality and few of them dated. It is probable that the species occurs throughout the Eastern United States, but may not extend far southward.

The range of variation is much like that given for *heterodoxa* and is chiefly a matter of contrast. In some examples the base is quite a clear yellow and on this a deep rich red makes a striking specimen. In others everything is dull, or there is a grayish tinge. This is the only species in which an obvious outer line is usual on the under side.

Mr. Strecker's type is the usual Colorado form, in which the contrasts are not quite so great. Yet he would hardly have made the error had he not placed it at once with *commoides* as the closest ally. From that species it is, of course, easily distinguished.

LEUCANIA EXTINCTA Guenée.

Leucania extincta Guenée, Spec. Gen., Noct., I, 1852, p. 79.—Walker, C. B., Mus., Het., IX, 1856, p. 94.

Leucania linita Guenée, Spec. Gen., Noct., I, 1852, p. 81.—Walker, C. B., Mus., Het., IX, 1856, p. 95.—Smith, List Lepidoptera, 1891, p. 46, pr. syn.

Leucania scirpicola Guenée, Spec. Gen., Noct., I, 1854, p. 84.—Walker, C. B., Mus., Het., IX, 1856, p. 96.—Smith, List Lepidoptera, 1891, p. 46, pr. syn.

Heliophila amygdalina Harvey, Can. Ent., X, 1878, p. 57.—Smith, Bull. 44, U. S. Nat. Mus., 1893, p. 187, pr. syn.

Ground color a very pale creamy yellow, primaries streaked with blackish and silver gray, tending to a faint reddish. Head with a slight admixture of brown scales in front. Collar with two dark gray transverse lines. Thorax immaculate. Primaries with all the veins narrowly white. A whitish dot marked by black scales at the end of the median. A series of black dots forming the transverse posterior line and this line is abruptly bent inward on vein 4. Secondaries white, semitransparent, with a somewhat yellowish tint. Beneath, primaries a little smoky on disk, and with a blackish costal spot; secondaries a little yellowish and powdery along the costa.

Expanse.—1.30 to 1.44 inches (33 to 36 mm.).

Habitat.—Maine; New York; Florida; Newark, New Jersey, May 12, 16, July 25 (Buchholz, Weidt); Elizabeth, August 4 (Kemp).

Five examples, all of them from Newark and Elizabeth, New Jersey, are before me. The species is not represented in any of the large collections, and yet it has a considerable range. Druce records it from

Mexico and adds *insueta* Guenée and *antica* Walker to the synonymy above given. As to the latter, he may be right; the description being of a South American species did not require me to identify it. As to *insueta* he is surely in error, for I compared the examples in the British Museum, and, in addition, the description does not fit at all. Guenée, who in all the other descriptions mentions the pointed apex of primaries and the very oblique hind angle, expressly states for *insueta* that they are less sharp than in *completa*, with which he compares it. In addition, mention is made of the black basal streak, obvious in *insueta* and absolutely wanting in *extincta*.

With a good example at hand it is simply impossible to mistake the species from its wing form and the gray strigation. But when the insect is a little rubbed, matters are not so easy. The characteristic wing form is destroyed by rubbed fringes; the gray interspacial lines are easily marred and there remains an almost characterless individual. It is in this way that M. Guenée fell in error.

Enough has been said under the group heading to place the species on structural characters.

LEUCANIA JUNCICOLA Guenée.

Leucania juncicola GUENÉE, Spec. Gen., Noct., I, 1852, p. 83.—WALKER, C. B., Mus., Het., IX, 1856, p. 96.

Heliophila adjuta GROTE, Bull. Buff. Soc. Nat. Sci., II, 1874, p. 158; Bull. Buff. Soc. Nat. Sci., III, 1875, p. 8.—SMITH, Bull. 44, U. S. Nat. Mus., 1893, p. 188, pr. syn.

Ground color a rather bright creamy yellow, strigation of the primaries luteous. Head with a frontal and interantennal purplish line. Collar crossed by two dusky lines near the middle, and at the tip a series of four contiguous lines of different colors gives the impression of a reddish or purplish band. The little anterior crest has the same purplish markings. Primaries with the veins whitish; the interspaces with at least two narrow, luteous lines. Median vein a little more broadly pale, inclosing a small black dot at its tip. The transverse posterior line is usually indicated by two venular dots only, but may be complete. A black dot is in the submedian interspace about one-third from base. There are no strongly marked shadings, but it is readily seen that a somewhat darker shade extends below the median to its end, broadens out a little and continues to the outer margin, extending from vein 4 and to the apex. Another shading extends over the subcostal and, broadening out somewhat, reaches the costa before the apex. A series of very small, black terminal dots. Fringes concolorous. Secondaries somewhat pearly white at base, semitransparent, with a smoky outer border and yellowish fringes. Beneath, primaries with an obvious pinkish tinge, the disk tending to blackish. Secondaries with the costa yellowish, powdery, and a series of black terminal spots in the interspaces.

Expanse.—1.30 to 1.45 inches (32 to 36 mm.).

Habitat.—Texas in March; Florida; Alabama.

Eight examples are at hand just now, all very much alike. Except for two examples from San Antonio, they have State labels only, and not one has a date of capture. One female has a marked reddish tinge in the ground and the secondaries are almost uniformly smoky. The Florida example is more obviously streaked than the others, but differs in no further point.

The ornamentation of the collar is the most characteristic feature of the species, and this tends to getting in red or scarlet in addition to or place of the black.

LEUCANIA MULTILINEA Walker.

Leucania multilinea Walker, C. B., Mus., Het., IX, 1856, p. 97.
Leucania commoides Grote, Proc. Ac. Nat. Sci. Phila., 1875, p. 419.
Heliophila lapidaria Grote, Proc. Ac. Nat. Sci. Phila., 1875, p. 419.—Smith, Bull. 44, U. S. Nat. Mus., 1893, p. 187, pr. syn.

Ground color creamy yellow. Head immaculate. Thorax with three gray or blackish transverse lines, the upper one broadest. Disk of thorax and patagiæ a little black speckled. Primaries with veins white or whitish, the strigations in the interspaces dark and well marked. Median vein white, inferiorly margined by black or brown to the end. A black dot in the white area at end of vein. A smoky shade bases on vein 4 and broadens toward the apex, which it reaches on outer margin. A dusky shading over the subcostal region and another parallel with and close to inner margin. Transverse posterior line reduced to two dots. A series of small black terminal dots. Secondaries white, with small black terminal dots. Beneath, primaries faintly yellowish, the disk more or less blackish, veins more or less black marked; secondaries somewhat yellowish and powdery along the costa.

Expanse.—1.30 to 1.40 inches (32 to 35 mm.).

Habitat.—Miami, Palm Beach, Florida (Dyar); Harris County, Texas, August 10 (Barnes); Kansas (Snow); Albany, New York, June and July; Winnipeg, Manitoba (Hanham).

A series of thirteen examples shows little variation, and among the strigate rather obtuse winged forms the pure white secondaries of both sexes make this easily separable. The only species with which it is likely to be confounded is *juncicola*, and that can be very easily determined if the material is at all good.

LEUCANIA COMMOIDES Guenée.

Leucania commoides Guenée, Spec. Gen., Noct., I, 1852, p. 86.—Walker, C. B., Mus., Het., IX, 1856, p. 96.—Speyer, Stett. Ent. Zeit., XXXVI, 1875, p. 113.

Ground color dull grayish luteous, more or less brightened by red or brown. Head tends to rusty brown. Collar with three leaden gray transverse lines. Thorax a little black powdered. Primaries more or less shaded with red brown and streaked with black. A prominent black streak below the broadly white median vein. A black dot at the branching of the median vein. Veins narrowly white, and hence the costal region is a little paler. A black mark is on the inner margin near the base; another is in the submedian interspace toward the anal angle. Other black streaks are in the interspaces above vein 3, forming the base of a triangular dusky shade. Transverse posterior line punctiform, not well marked. A series of black terminal dots. Secondaries dirty fuscous, with pale yellowish fringes. Beneath, the sexual tuftings are discolored, brown. Primaries reddish gray, powdery, a little darker on the disk. Secondaries whitish, with the costal area powdery, yellowish.

Expanse.—1.40 to 1.50 inches (35 to 37.5 mm).

Habitat.—Nova Scotia; Canada; Winnipeg, Manitoba, July 2 (Hanham); Maine (Fernald); Massachusetts; Albany, New York, June 22 (Bailey); New York, June to August; Wisconsin; Minnesota; Illinois; New Mexico (Snow); Colorado; Florida in March.

The species has a wide distribution, is not at all rare, and is easily recognized. The prominent black streak beneath the white median vein and the dark red color are distinctive characteristics. Add to this the prominent abdominal and leg tuftings of the male and the species becomes unmistakable.

The leg tuftings are as follows: Anterior femora with a continuous fringing of hairy scales beneath, making a thick mass, but no tuft. Tibia with a thick outward scaling, but no tuftings or longer hair. Middle leg somewhat shortened, tibial spurs long, the inner curved and somewhat flattened. Femora with continuous dense fringing of long hair and scales, longer at base. Tibiæ with long hair tufts in front and at sides, capable of brush-like expansion; one at the side may be also capable of fan-like expansion. Posterior femora with long hair fringe basally. Tibiæ with longer hair outwardly toward base, but no brush.

The harpes of the genitalia are densely clothed outwardly with long yellow hair, intermixed with broadly flattened scales, forming a mass that can be fluffily expanded, making neither a definite brush nor fan-like expansion.

LEUCANIA PHRAGMATIDICOLA Guenée.

Leucania phragmatidicola GUENÉE, Spec. Gen., Noct., I, 1852, p. 89.—WALKER, C. B., Mus., Het., IX, 1856, p. 97.

Heliophila phragmatidicola var. *texana* MORRISON, Proc. Bost. Soc. N. H., XVII, 1874, p. 211.

Ground color a very pale luteous, varying to grayish or reddish, sometimes reaching a decided warm fawn brown. Head and thorax concolorous. Collar with three darker transverse lines, which tend to obsolescence, that just below the tip being broadest. Anterior crest and patagiæ sometimes a little speckled with blackish scales. Primaries more or less obviously strigate, the veins white or whitish, interspacial narrow lines ranging from dull luteous to smoky or even blackish. Median vein obviously white, bordered on each side by a smoky or blackish shading, that beneath being the more prominent. At the end of the vein the white enlarges as it includes the base of the branches and here a black dot precedes and a blackish or smoky shade follows the branching, thus extending for a little distance the dark shading below the median vein. A vague triangular cloud is on the outer margin above vein 4, extending to the apex, and a somewhat lighter shading extends from base through the cell, obliquely to the apex itself. A series of small black terminal dots is obvious in most specimens. Secondaries white or whitish, sometimes with a yellowish tinge, with a narrow smoky outer border and a series of terminal black dots, which, as a rule, are best marked where the smoky shading is best. Beneath, primaries creamy or reddish, powdery, tending to smoky on the disk; secondaries white except over the costal region, where it is creamy and somewhat powdery.

Expanse.—1.28 to 1.52 inches (32 to 37 mm.).

Habitat.—Canada to Florida, to Texas, to California; Iowa; Minnesota; Illinois. The dates cover every month from March to October, inclusive.

This is one of the most widely distributed, and, in a certain way, the most variable of the species. There are, obviously, two broods in the Middle Atlantic States, adults appearing in May and June and again in August and September. New Jersey specimens are before me for every month from May to October. In Florida and Texas the early dates are in March. Los Angeles, California, specimens are dated April.

Nearly forty examples are under inspection and in such variety that it would seem certain that they could be arranged in series of distinct forms, but I have failed on all bases tried.

Some specimens are almost creamy yellow, without contrasts, the median vein hardly white, its blackish border hardly traceable. The primaries seem broader, the margins subparallel. Another series is obviously gray, with or without a reddish shade, the strigation obvious, the markings over the median vein conspicuous. Here the wings seem more trigonate and the apices more pointed. Then comes a series in which the primaries seem longer and narrower, the body slighter, color decidedly reddish fawn, the median dusky streak unusually prominent, and extending almost to the transverse posterior line; but when these extremes are carefully separated out, the remaining forms block out every gap and leave us with one series only. The differential points have been elsewhere brought out.

I can not place the variety *texana* Morrison. I have nothing so small as 29 mm. in expanse, and nothing in which the lines on the collar are not at least traceable. The essential differences as pointed out by Mr. Morrison are: "They expand only 29 mm.; the collar lacks the black transverse line of the typical form; the ground color is clear and whitish, not becoming suffused with reddish or dark ochreous before the terminal space."

Mr. Grote in describing *ligata* refers to this variety as if he thought Mr. Morrison might have had such a form as his new species before him, but this seems hardly credible.

LEUCANIA IMPERFECTA Smith.

Leucania imperfecta SMITH, Trans. Am. Ent. Soc., XXI, 1894, p. 76.

Ground color a dull luteous, shaded with smoky or blackish. The head may be of the pale ground or of the smoky tint. Collar with three purplish black transverse lines; patagiæ blackish at base of primaries, tending to the pale ground on the disk. Primaries darker over the costa, through the middle of the wing, along the inner margin, and in the terminal space before the apex. This leaves the pale ground as a long shade through the cell from base to apex and through the submedian interspace from base to the transverse posterior line. The shadings are all quite even and not obviously strigate. Median vein accompanied by a blackish streak which may or may not darken it to the end. At the branching there is always the angular white spot, emphasized by a preceding black dot. In one specimen the vein is narrowly white throughout. The other veins may or may not be partly white marked. There may be a series of small black terminal dots and a yellowish line at the base of the fringes.

Secondaries, transparent, somewhat pearly white at base, the veins smoky or blackish; a somewhat diffuse, smoky margin, variable in width. Fringes with a yellowish line at base. Beneath, primaries gray, powdery, the disk tending to and sometimes all blackish. Secondaries white, powdery over the costal and apical area.

Expanse.—1.28 to 1.52 inches (32 to 38 mm.).

Habitat.—Santa Rita Mountains, Arizona, June 19 (Schwarz); Chiricahua Mountains, Arizona, June 26 (Hubbard); Wilgus, Cochise County, Huachuca Mountains, and southern Arizona (Barnes).

Seven examples from so many localities in Arizona indicate that it is not really a rare species. There seems to be little variation except in size, and that is not sexual, since the largest and smallest examples are both males.

In the male the sexual tuftings are not very prominent. On the anterior legs the femora have a moderate scale fringing at base, becoming shorter toward tip; the tibia is a little scale thickened outwardly. On the middle leg the femoral fringe is a little longer, the tibia is decidedly thickened with long hair outwardly, not forming obvious tufts. On the posterior legs the femoral fringe is much longer and reaches almost to base; the tibiæ have long thin hair which does not form tufts. The anal tuftings are not very dense exteriorly, but there are two pencils of yellow hair within the genital cavity.

LEUCANIA ANTEROCLARA, new species.

Ground color a very pale luteous, almost whitish or creamy. Collar paler with three more or less obvious transverse bands which tend to and sometimes are purplish. Primaries obviously streaky but varying in the amount of contrast. Veins paler, the median whitish, as a rule, and 3 and 4 may be whitish for a part or all their course. A smoky or olivaceous luteous shading below the median vein. Discal dot a mere point which may be altogether absent. Transverse posterior line usually reduced to two black points, never complete. There is a very well-marked tendency to darker streaks above vein 4, emphasizing the triangular dusky subapical shade. In some specimens a series of small black terminal dots is obvious. Secondaries white, with a pearly luster or yellowish tinge in the male, with a vague dusky outer shading, the veins dusky; in the female with a broader, smoky border and the entire wings tending to dusky. Beneath, primaries creamy to reddish, more or less powdery, the disk more or less blackish. Secondaries white, the costal margin creamy, powdery.

Expanse.—1.40 to 1.56 inches (35 to 39 mm.).

Habitat.—Calgary, Alberta, June 25, July 10, August 13 (Dod); Yellowstone Park, Wyoming, August, (Barnes); Corvallis, Oregon, July 6 (Cordley); Glenwood Springs, Colorado, June 10 (Barnes).

Twenty-one specimens are under examination; all the females a little darker and more streaky than the males.

The differences between this species and *phragmatidicola* have been already discussed. Comparing two series their distinctness is obvious; comparing selected individuals of each series the sexual characters might have to be resorted to. It is suggestive of a local form that I have no *phragmatidicola* from the range given for this species, nor any example of this species within the range given for *phragmatidicola*.

In the male the anterior femora have long, scaly fringes more than half the distance from base; the tibiæ are thickened with scaly vestiture outwardly. Middle legs with equal femoral fringes for their entire length. Tibiæ with long hair, capable of partly fan-like expansion in front and at the sides; the outer spurs short and cylindrical. Posterior femora fringed their full length, the fringe longer at base; tibiæ with somewhat longer thin hair outwardly. The harpes are clothed outwardly with dense hair and scales but these do not form prominent tuftings. Altogether the characters, while of the same type as in *phragmatidicola*, are very much reduced.

Type.—No. 6250, U.S.N.M.

LEUCANIA CALGARIANA, new species.

Ground color a pale luteous, overlaid, streaked or washed with red. Collar almost whitish, quite contrasting, crossed by three dark gray transverse lines. Primaries obviously strigate. Median vein conspicuously white; its branches (three and four) also white as a rule and, in addition, most of the other veins are more or less whitish. A blackish or at least darker shade below the median vein and extending vaguely beyond it to form the usual trigonate subapical cloud. Discal black dot small or wanting. Transverse posterior line reduced to two dotlets or altogether wanting. Secondaries white or slightly yellowish, with a more or less obvious smoky margin. Beneath, primaries reddish gray, powdery, tending to a blackish disk. Secondaries white, costal region reddish, powdery.

Expanse.—1.48 to 1.56 inches (37 to 39 mm.).

Habitat.—Calgary, Alberta, June 20 to July 28 (F. H. Wolley Dod).

Ten examples, all from Mr. Dod and all in good condition.

This species is conspicuously different in color from the others of this series and is also the largest in average expanse. It is most nearly allied to *anteroclara* and is that species suffused with red. Whether it is merely a color variety or not I can not now say. Nothing like it has come from other localities. Mr. Dod has sent me about twenty examples of both forms and there is no difficulty whatever in separating the two. I prefer, under the circumstances, to risk the specific name until a careful study of the early stages determines the status of forms.

Type.—No. 6243, U.S.N.M.

LEUCANIA STOLATA Smith.

Leucania stolata Smith, Trans. Am. Ent. Soc., XXI, 1894, p. 76, pl. v, fig. 8.

Ground color a pale straw yellow. Collar with two transverse dark lines. Patagiæ with a dusky powdering near the margin. Primaries with the median vein white, a short spur marking the inception of vein 2, while veins 3 and 4 are white a little distance from their point of inception. A smoky brown shade accompanies this line inferiorily, and extends beyond the cell as an elongate dusky triangle between veins 4 and 6, fading out before the margin is reached. A less distinct brownish shade extends along the inner margin, and a vague smoky tinge is apparent over the costal and apical region. Between the veins, beyond the cell, are faint darker longitudinal brown lines, giving the wing there a feebly strigate appearance. A series of small black terminal dots and a small dot at the end of the median vein. Secondaries white. Beneath white, feebly irrorate, primaries with a somewhat yellowish tinge.

Expanse.—1.28 inches (32 mm.).

Habitat. Arizona.

I have seen nothing like this since the original description was published; hence the type is yet unique.

LEUCANIA OREGONA, new species.

Ground color pale fawn or reddish gray. Collar with two darker transverse lines. Disk of thorax a little powdery. Primaries obviously strigate. Veins white or nearly so, the end of the median forming an obvious white mark emphasized by a preceding black dot. A smoky line below the median vein, extending beyond it above vein 4 to form the usual subapical dusky cloud. Transverse posterior line punctiform, complete. Terminal space and fringes smoky. Secondaries white, with a series of black terminal marks. Beneath reddish gray, powdery; secondaries white, costal region powdery reddish gray.

Expanse.—1.20 inches (30 mm.).

Habitat.—Corvallis, Oregon, at light, April 11 (Cordley).

One male in very fair condition. The species resembles a pale, much reduced *subpunctata*, and is altogether different from anything else in this group.

The femoral fringings are present in a reduced form in this species, and all the tibiæ have long, thin, hairy clothing, but not any of them have it to form tufts of any kind.

LEUCANIA ROSEOLA Smith.

Leucania roseola SMITH, Trans. Am. Ent. Soc., XXI, 1894, p. 75, pl. v, fig. 9.

Ground color very pale yellow, suffused with red of varying shade, tending to light brick red. Collar with three somewhat darker transverse lines. Primaries with veins paler, the intervals so closely strigate that the impression is given of an almost even color. Median vein not contrasting, only a little paler at tips. No obvious discal dot, but a slightly dusky shading beyond the forking. Transverse posterior line a complete series of smoky dots or absent altogether, with all the intermediate forms and everything in favor of the obsolescence of the dots. Secondaries white. Beneath reddish gray, the primaries with an irregular outer venular band. Secondaries white, except on the costal area.

Expanse.—1.46 to 1.56 inches (36 to 39 mm.).

Habitat.—Pullman, Washington, June 12 (Piper); Corvallis, Oregon, June 20 (Cordley); British Columbia in July; Livingston, Vancouver, July 11

Eight examples are at hand just now and I have seen others. The almost uniform red color of the wing without any contrasts identifies this form as compared with *farcta*.

LEUCANIA FARCTA, Grote.

Heliophila farcta GROTE, Can. Ent., XIII, 1881, p. 15.
Leucania farcta SMITH, Bull. 44, U. S. Nat. Mus., 1893, p. 188.

Ground color a pale creamy yellow. Collar with three somewhat purplish transverse lines. Primaries strigate, but without contrasts. The median vein is white or whitish, without contrast or obvious margins. A black dot at the end of the cell. Transverse posterior line reduced to two black points. A faint triangular cloud below apex. A series of black terminal dots. Secondaries white. Beneath, primaries yellowish, only a little powdered on the disk; secondaries with powdery costa and some black dots on the outer margin.

Expanse.—1.46 to 1.56 inches (36.5 to 39 mm.).

Habitat.—Los Angeles, California, April 16 (Howard); Los Angeles County, in April (Koebele); Fresno, California (Schwarz); Sierra Nevada (Henry Edwards).

Five examples are under examination; all very much alike. The species is an easily recognizable one with its very pale colors and simple, obscure maculation.

LEUCANIA PALLISECA, new species.

Ground color a very pale whitish yellow. Collar with three dusky transverse bands. Primaries feebly and not contrastingly strigate, all ordinary markings reduced to the vanishing point. Median vein scarcely defined in any way. Discal dot minute or wanting. Transverse posterior line consists of very small black dots and is never complete; sometimes wanting. A series of minute terminal dots. Secondaries pure white, immaculate. Beneath, white; primaries with a creamy tint and a little tendency to darken on the disk; secondaries a little powdery over the costal region.

Expanse.—1.25 to 1.45 inches (31 to 36 mm.).

Habitat.—Los Angeles County, California, in July (U.S.N.M.); Fresno, California (Schwarz); Denver, Colorado, May and October.

Seven examples are at hand and are about as nearly immaculate as a species in this series can well be. Oddly enough, all the specimens are females, and I was at first inclined to consider them female *farcta;* but I have that sex fully agreeing with the male, and therefore prefer to consider this a good species.

Type.—No. 6251, U.S.N.M.

NELEUCANIA, new genus.

Eyes hairy, without bristly lashes, round, convex, not prominent. Head as a whole moderate in size, retracted rather than prominent, but not strongly defined either way, vestiture loose, fine hair, giving a smooth woolly appearance. Palpi moderate or rather short, oblique, reaching to and sometimes exceeding middle of front, rather slender. the terminal joint proportionately rather long, oblique or even drooping, vestiture loose. Antennæ in the male feebly ciliated. Thorax moderately developed, with loose, long, thin vestiture forming no tufts and leaving collar and patagiæ undefined. Abdomen reaching to or exceeding the hind angle of secondaries, more often longer and somewhat disproportionately slight. Legs unarmed except for the usual tibial spurs, in the male with more or less well-marked sexual tuftings, which are most obvious on the middle tibiæ. Primaries rather narrow, elongate, the costa a little depressed, apices a little pointed, outer margin a little arcuate or entirely rigid, oblique.

The male genitalia are of the same type in all, and very much alike: there is a pair of oblong harpes, rounded at the tip, broadly or narrowly as the case may be, not modified or spined in any way, and on each a single curved corneous clasper, varying somewhat in the species.

The genus differs from *Leucania* chiefly in the narrow subequal primaries, having the costa depressed, the outer margin rather rigidly cut off, and in the long abdomen. The loose, hairy vestiture, forming no tufts and leaving the thoracic parts undefined, adds to the distinctive appearance.

As a whole the species resemble each other closely. The primaries range from pale creamy yellow to reddish, the costal edge white in the species known to me, median vein usually white and usually a dusky longitudinal shade through the middle.

Niveicosta is the best marked and a little the more robust of the species, the body parts being stouter in proportion than in any of the others. The primaries are reddish luteous, the costa narrowly yet distinctly white. The median vein is also white, though not prominently so, and it is usually accompanied by a well-marked dusky shading which may reach very close to the outer margin. The transverse posterior line is punctiform and completely traceable in all the specimens. The secondaries are slightly smoky, with a faint reddish or yellowish tinge. The male has a fringing of thin hair on the under side of the anterior and posterior femora, and on the middle femur there is an expansile tuft of hair at the base. The anterior and posterior tibiæ are hairy, but not really tufted; the middle tibia has a dense brush or tuft of hair extending all the way down the outer side, and this is capable of fan-like expansion. All the specimens are from Colorado.

Bicolorata has the primaries a very pale yellow and the secondaries reddish. In some specimens the wings are practically immaculate, and of this form was the type of the species. In most good examples, however, the white costa and median vein are obvious, and in one specimen the punctiform transverse posterior line is almost complete The body is smaller and the abdomen in both sexes is much longer than in the preceding species.

The sexual tuftings are as in the preceding species, but all very much exaggerated. The middle tibia is somewhat abbreviated and the tuftings when expanded form an almost complete circle. The posterior femur and tibia have each a tuft at base, in the former extending beyond, in the latter to the middle of the respective parts.

This species seems to have a wider distribution, extending from Colorado into Arizona and New Mexico.

Citronella is decidedly smaller than the preceding two species. The primaries are pale luteous, with a vague smoky tinge, and the secondaries are decidedly smoky in both sexes. The primaries have the costal edge white, and in all of them the smoky shade along the median vein and extending nearly to the outer margin is well marked; but the white along the median vein itself may be entirely wanting. The transverse posterior line is punctiform, complete, and well marked in all the specimens. The sexual characters are in essentials like those of *bicolorata*, but not nearly so prominent. All the examples are from Colorado.

The three species above defined are closely allied, but, I think, really distinct. With a good series, such as I have had under examination, the differences become clear, and with any good specimens under examination there should be no difficulty in placing even single examples.

Patricia is entirely different. The primaries are very pale creamy yellow or almost white, with an obvious smoky or blackish streak through the middle from base to the outer margin. The secondaries are smoky white, and as a whole the species looks white. It is about the size of *citronella*, but looks smaller and really is slighter. The sexual tuftings in the male are so reduced as to be scarcely noticeable except on close inspection. The species occurs in Colorado and New Mexico.

Prægracilis belongs here without much doubt. Mr. Grote says that it is a very slight species, yellow white and absolutely immaculate. I have not seen it. The type is from Idaho.

In tabular form the species known to me may be arranged as follows:

Primaries reddish luteous, with a punctiform transverse posterior line; secondaries whitish or smoky	*niveicosta.*
Primaries light yellow, immaculate; secondaries reddish	*bicolorata.*
Primaries light yellow, with a punctiform transverse posterior line; secondaries white or smoky, size smaller	*citronella.*
Primaries pale creamy, with a central smoky stripe; secondaries smoky white, size small	*patricia.*
Primaries yellow white, absolutely immaculate; very slight	*prægracilis.*

NELEUCANIA NIVEICOSTA, new species.

Ground color reddish luteous, verging to brick red. Head and collar darker, more red-brown. Thoracic disc of the ground color.

Primaries without contrasts of any kind. Costa narrowly but distinctly white. Median vein white, not broadly or prominently so, in some cases with a short white extension on the branches. There is a vague darkening through the middle of the wing, but not a real shade. Transverse posterior line indicated by a more or less complete series of venular black dots. It is not complete in any example before me; but in no case is there any doubt of its presence in great part. A series of minute black terminal dots. Secondaries whitish to smoky, even. Beneath white, ranging from almost immaculate to densely powdered. Primaries tending to a pinkish suffusion and sometimes to a black disk.

Expanse.—1.10 to 1.25 inches (27.5 to 31 mm.).

Habitat.—Glenwood Springs, Colorado, June, July, August, and September.

Five examples, all from Dr. William Barnes, and all save one in good condition. There is very little variation, and except in the somewhat lighter or deeper tint of the primaries and a little difference in the number of spots composing the transverse posterior line the specimens are the same.

Type.—No. 6252, U.S.N.M.

NELEUCANIA BICOLORATA Grote.

Heliophila bicolorata Grote, Papilio, I, 1881, p. 154.
Leucania bicolorata Smith, Bull. 45, U. S. Nat. Mus., 1893, p. 185.

"Male, eyes hairy; thorax untufted; tibiæ unarmed. Fore wings and thorax light straw color, immaculate, concolorous. Hind wings and abdomen pale reddish. Beneath the wings are shaded with reddish, like secondaries above. There are no markings whatever."

Expanse.—1.12 to 1.25 inches (28 to 31 mm.).

Habitat.—Colorado (Bruce); Glenwood Spring, Colorado, August 25 (Barnes); Merino Valley, New Mexico, June 26 (Wheeler Exp.); Chiricahua Mountains, Arizona, June 26 (Hubbard); Tucson, Arizona.

Six specimens are at hand, all agreeing in a general way with the above description, which is copied from Mr. Grote's original characterization. In most of them, however, the costa and median vein are obviously whitish, and in three specimens a few minute black dots indicate the transverse posterior line.

NELEUCANIA CITRONELLA, new species.

Ground color a dirty pale lemon yellow with a smoky tinge. Head and collar darker, more decidedly smoky. Primaries with the costa narrowly white, the median vein at least partly white marked. Transverse posterior line punctiform, complete in the specimens before me. A black dot on internal vein indicates the location of the transverse anterior line. A series of small black terminal dots. The secondaries range from dirty white to smoky. Beneath, ranging from almost immaculate whitish to dirty fuscous or yellowish; sometimes with only the disk of primaries blackish.

Expanse.—1.08 to 1.15 inches (27 to 29 mm.).

Habitat.—Denver, Colorado, July 15 (Bruce, Oslar); Glenwood Springs, Colorado, July 16–August 16.

Six examples all very much alike above and no two alike beneath. There is more difference in the color of the secondaries than in the primaries, and on the whole not enough anywhere to cause doubt.

Type.—No. 6253, U.S.N.M.

NELEUCANIA PATRICIA Grote.

Heliophila patricia GROTE, Bull. Bkln. Ent. Soc., III, 1880, p. 46.
Leucania patricia SMITH, Bull. 44, U. S. Nat. Mus., 1893, p. 186.

"Fore wings yellowish buff. A silvery-white stripe on the median vein, extending on vein 4. Above this a dusky stripe, from the base outwardly to near the margin. Veins and costal edge whitish. Thorax buff. Hind wings white. Beneath whitish."

Expanse.—1.05 to 1.12 inches (26 to 28 mm.).

Habitat.—Colorado (Bruce); Las Vegas, New Mexico; Hot Springs, New Mexico, 7,000 feet (Hulst).

Only three examples are before me at present; but I have seen others and noted no essential differences. The species is so unlike any other as to be recognizable at a glance.

NELEUCANIA PRÆGRACILIS Grote.

Heliophila prægracilis GROTE, Bull. Geol. Surv., III, 1877, p. 119.
Leucania prægracilis SMITH, Bull. 44, U. S. Nat. Mus., 1893, p. 185.

"The most slender species of the genus. Eyes hairy. Smaller and slighter than *pallens*. Yellow white, not buff as in *pallens*, absolutely immaculate. Head and thorax more yellowish. Length of primary 12 mil. One specimen, Idaho, July 6. This species seems slighter than *Senta defecta* Grt."

The above is Mr. Grote's description, and I can add nothing to it from personal knowledge. Colorado and New Mexico are cited as additional localities in my catalogue, but I can not now remember on what authority.

Of the species catalogued by me in 1893 and not elsewhere referred to in this paper, *Leucania rufostriga* is a *Caradrina* and probably the species described by me as *C. punctivena*. Dr. Packard's type is in the Museum of Comparative Zoology at Cambridge, and Mr. Henshaw very kindly compared with it a Labrador example which Dr. Dyar suggested might have been intended. The suggestion proved accurate and I believe that the differences between this example and the British-American specimens are not sufficient to hold my species.

Leucania ebriosa Guenée is a Tasmanian form, Sir George F. Hampson declares, and I am quite ready to believe him. I doubted the "Am. Sept." habitat when I saw the insect in 1892.

Leucania obusta Guenée is also said to be Tasmanian; but this subject is elsewhere referred to.

Of all the species described from our fauna there is one only that I have not seen.

LIST OF THE SPECIES.

- Leucania Ochs.
  - lutina Smith.
    - *velutina* Smith.
  - unipuncta Harvey.
    - *extranea* Guenée.
  - pseudargyria Guenée.
    - var. *callida* Grote.
  - pilipalpis Grote.
  - subpunctata Harvey.
    - *complicata* Strecker.
  - luteopallens Smith.
    - *pallens* Auct. Amer.
  - minorata Smith.
  - oxygale Grote.
  - rubripallens Smith.
  - pertracta Morrison.
  - rubripennis Grote and Robinson.
  - albilinea Hübner.
    - *henrici* Grote.
  - obscurior Smith.
  - diffusa Walker.
    - *moderata* Walker.
  - limitata Smith.
  - tetera Smith.
  - neptis Smith.
  - ligata Grote.
  - flabilis Grote.
  - rimosa Grote.
  - dia Grote.
  - megadia Smith.
- Leucania Ochs—Continued.
  - heterodoxa Smith.
  - insueta Guenée.
    - *adonea* Grote.
    - *mimica* Strecker.
  - extincta Guenée.
    - *linita* Guenée.
    - *scirpicola* Guenée.
    - *amygdalina* Harvey.
  - juncicola Guenée.
    - *adjuta* Grote.
  - multilinea Walker.
    - *lapidaria* Grote.
  - commoides Guenée.
  - phragmatidicola Guenée.
    - var. *texana* Morrison.
  - imperfecta Smith.
  - anteroclara Smith.
  - calgariana Smith.
  - stolata Smith.
  - oregona Smith.
  - roseola Smith.
  - farcta Grote.
  - palliseca Smith.
- Neleucania Smith.
  - niveicosta Smith.
  - bicolorata Grote.
  - citronella Smith.
  - patricia Grote.
  - prægracilis Grote.

EXPLANATION OF PLATES.

PLATE V.

1. Harpe and clasper of male *Leucania unipuncta*.
3. Harpe and clasper of male *Leucania subpunctata*.
4. Harpe and clasper of male *Leucania luteopallens*.
   The structures in *Leucania oxygale* and *Leucania rubripallens* are practically identical.
5. Harpe and clasper of male *Leucania minorata*.
6. Harpe and clasper of male *Leucania pallens* (European).
7. Harpe and clasper of male *Leucania rubripennis*.
8. Harpe and clasper of male *Leucania albilinea*.
   The characters of *Leucania obscurior* are practically identical.
9. Harpe and clasper of male *Leucania diffusa*.

10. Harpe and clasper of male *Leucania limitata.*
11. Harpe and clasper of male *Leucania tetera.*
12. Harpe and clasper of male *Leucania neptis.*
13. Harpe and clasper of male *Leucania ligata.*

The characters of *Leucania flabilis* and *Leucania rimosa* are identical.

14. Harpe and clasper of male *Leucania dia.*
15. Harpe and clasper of male *Leucania megadia.*
16. Harpe and clasper of male *Leucania heterodoxa.*
17. Harpe and clasper of male *Leucania insueta.*
18. Harpe and clasper of male *Leucania extincta.*

PLATE VI.

2. Harpe and clasper of male *Leucania pseudargyria.*
19. Harpe and clasper of male *Leucania juncicola.*
20. Harpe and clasper of male *Leucania multilinea.*
21. Harpe and clasper of male *Leucania commoides.*
22. Harpe and clasper of male *Leucania phragmatidicola.*

The characters of *Leucania anteroclara* are practically like this.

23. Harpe and clasper of male *Leucania calgariana.*
24. Harpe and clasper of male *Leucania oregona.*

The characters of *Leucania imperfecta* are practically the same.

25. Harpe and clasper of male *Leucania roseola.*
26. Harpe and clasper of male *Leucania farcta.*
27. Harpe and clasper of male *Neleucania bicolorata.*

The characters of *Neleucania niveicosta* and *Neleucania citronella* are very similar.

28. Harpe and clasper of male *Neleucania patricia.*